THE
POPULAR SCIENCE
MONTHLY

MAY, 1906

WATKINS GLEN AND OTHER GORGES OF THE FINGER LAKE REGION OF CENTRAL NEW YORK[1]

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FOR some years there has been an effort made to induce the legislature of the state of New York to set aside Watkins Glen as a state reserve for the benefit of the public. As one of the most beautiful and most widely known bits of natural scenery in the state, it seems

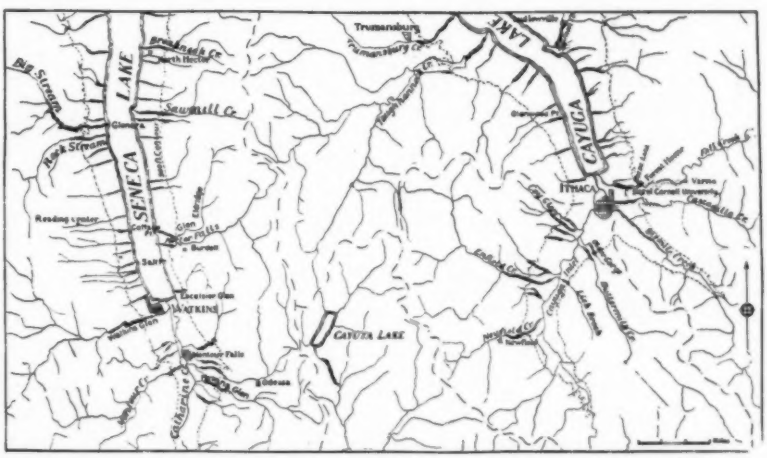

FIG. 1. SKETCH MAP OF THE SOUTHERN ENDS OF THE CAYUGA AND SENECA VALLEYS, Showing the Location of some of the Gorges.

to many of the lovers of this spot that the legislature should take the necessary action for securing the glen as a public park; and there now appears to be reason for hoping that this will be done during the present session of the legislature.

[1] Published by permission of the director of the U. S. Geological Survey.

FIG. 2. PHOTOGRAPH OF MODEL OF ITHACA SHEET. (BY WILLIAM STRANAHAN.)

Watkins Glen is but one of a great number—certainly many scores, and probably hundreds—of picturesque gorges in southern central New York, many of them unnamed, and the great majority known only to a few. They lie in the southern half of the Finger Lake valleys, notably Seneca and Cayuga (Fig. 1), cut in the slopes of the valleys which enclose these lakes. Such an abundance of gorges and associated waterfalls, more than can be found in equal area in any other part of eastern United States, is noteworthy, and seems to demand an unusual explanation, which in fact is the case. This explanation has been worked out step by step, being far more complex than at first supposed, and involving the operation of geological agencies now no

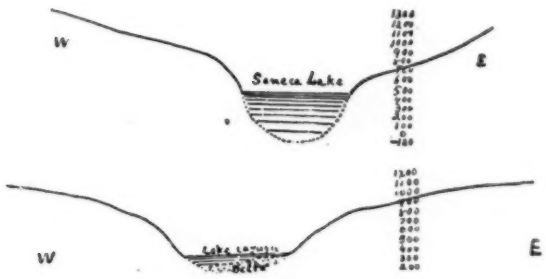

FIG. 4. CROSS SECTION OF SENECA LAKE, three miles north of Watkins. (Horizontal scale ⅛ inch to the mile; vertical scale, ½ inch to 1000 feet. Column of figures gives elevations in feet with reference to sea-level.)

FIG. 5. CROSS SECTION OF LAKE CAYUGA VALLEY, two miles north of Ithaca. (Scale same as Fig. 4.)

longer present. To state this explanation calls for a preliminary consideration of the general topography.

The Finger Lake valleys extend nearly north and south, long and narrow, like so many fingers, the two longest, Cayuga and Seneca, being about forty miles in length, and at the lake surface from one to three miles in width. Their bottoms are below sea-level. They are excavated in the plateau of southern New York, a dissected plateau of nearly horizontal Devonian shales and sandstones, trenched by many deep valleys (Fig. 2). But among these valleys those of the Finger Lakes stand out prominently because of certain notable peculiarities.

If one of the upland valleys of the plateau should be damned so as to contain a lake as deep as Cayuga (435 feet) or Seneca Lake (618 feet), or even one a hundred feet in depth, its shore-line would be very irregular, and its waters would extend as bays up the tributary valleys. But in the Finger Lakes this is not the case. The lake shores are smooth and regular (Fig. 3), and this condition extends for several hundred feet above the lake level. The valley walls enclosing the lakes are gullied only by the narrow gorges which are so abundant (Fig. 1). Not only are they smooth and regular, but they are steepened below the 900-foot contour line (Figs. 2 and 3), so that a profile of the valley slope shows a distinct increase in the steepness of the valley wall below that level (Figs. 4 and 5).

At the upper level of the steepened slope, upland valleys open out and lead back into the plateau, so that if the lake waters could be raised 500 feet higher than the present, they would enter into these tributary valleys and the lake shore line would become very irregular, as is natural in a stream valley dammed so as to hold a lake. These upland tributary valleys are broad and mature, having evidently required a long period for their formation; and their counterpart appears throughout the plateau region. They are the normal valleys of the region; the Finger Lake valleys the abnormal.

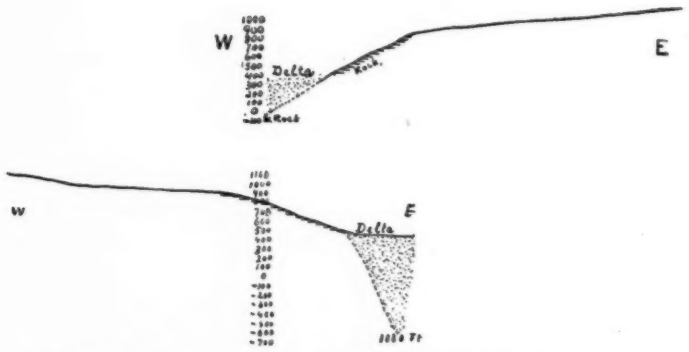

FIG. 6. PROFILE OF CASCADILLA CREEK, which descends the valley side at Ithaca, on the southern boundary of Cornell University campus. (Same scale as Fig. 4.)
FIG. 7. PROFILE ALONG WATKINS GLEN, IN SENECA VALLEY. (Same scale as Fig. 4.)

A significant view of these tributary valleys is obtained from the opposite main valley slope at such an elevation as to permit a view into them. Such a view shows that the broad valleys extend back into the upland, receiving numerous tributaries at the proper grade, and that these valleys are commonly enclosed between moderately sloping walls which flare apart as the lake valley is approached; but all this ends at about the 900-foot level, and the open mouth of the tributary valley is left hanging high above the main valley bottom on the edge of the smooth, steepened slope of the main valley. There the stream leaves its broad upland valley and plunges down the steepened main valley slope, into which it has sunk itself in a narrow and relatively shallow gorge, through which it leaps in a series of cascades and waterfalls.

Normally a tributary stream joins its main stream at an accordant grade, even in such a case as the Colorado River, where the main stream is rapidly deepening its valley. So general is this condition that a stream is ordinarily supposed to decrease in grade from headwaters to mouth at a fairly regular rate; and most streams follow this law. But here there is a normal decrease in grade up to a certain level, then an abrupt increase. Glen Creek, for example, which has formed Watkins Glen, descends at the rate of about a hundred feet to the mile for four miles, then falls in a succession of cascades four hundred feet in a single mile (Fig. 7). This change in grade accompanies a change from a broad, upper valley, over its lip into a narrow gorge cut in the smooth, steepened slope of the lake valley; and the same change occurs in the other streams of the southern half of Seneca and Cayuga valleys (Figs. 1, 2 and 6).

While the condition of smoothed, steepened main valley slopes and associated hanging tributary valleys is abnormal, it is not uncommon. It occurs in the fiords of Norway, New Zealand and Alaska; in the

valleys of the Alps, Rockies and Sierra Nevada; and associated with it is a condition of gorges and falls below the lips of the hanging valleys. It is a notable fact that these regions, like that of the Finger Lakes, are regions formerly occupied by powerful glaciers; and it is even more noteworthy that hanging valleys and associated steepened, straightened main valley walls are practically absent in regions not formerly occupied by glaciers.[2] So general is this association; so like the work of ice erosion, as we conceive it, is the anomalous valley form; and so unlike is it to the valleys of stream erosion origin, that physiographers are now quite generally agreed that the hanging valley and the broadened and straightened main valley are the result of glacial erosion.

There are still some who question this conclusion, but none of them has offered a satisfactory substitute or advanced a vital objection to the ice erosion explanation. It is a relatively new point in interpretation of land sculpturing and naturally is not universally accepted at the start. The same was true when the origin of ordinary valleys by stream erosion was proposed in place of the current explanation of catastrophes. In fact, some of the most ardent supporters of the ice-erosion theory are recent converts to it.

When the hanging valleys of the Finger Lake region were first recognized, and ice erosion proposed in explanation of them and of the main lake valleys,[3] there were few who accepted the conclusions advanced; but now the great majority of American physiographers accept the ice erosion explanation for this region, as well as for others. The literature of glacial erosion is now extensive, and the fact of profound ice erosion in valleys freely followed by glaciers seems established; but it would be aside from the purpose of this paper to state the full argument for glacial erosion, which, in fact, others have already done. Suffice it to say that glacial erosion will explain the conditions in the Finger Lake valleys, and no other theory so far proposed will do so. Moreover, these valleys were a highway for glacial motion, as is proved by the presence of pronounced moraines along their sides and at their heads.[4]

When the glacial erosion theory was first applied to these valleys it was supposed that the erosion was simple and of a single period; but the discovery of other facts led first to a question whether some other explanation than ice erosion might not be necessary,[5] and later to the

[2] This statement ought perhaps to be slightly qualified, since exceptional instances of hanging valleys have been described from such regions where other causes, such as marine erosion and faulting, account for the hanging valleys.

[3] Lincoln, *Amer. Jour. Sci.*, Vol. XLIV., 1892, pp. 290–293; Tarr, *Bull. Geol. Soc. Amer.*, Vol. V., 1894, pp. 339–356.

[4] Tarr, *Bull. Geol. Soc. Amer.*, Vol. XVI., 1905, pp. 215–228.

[5] Tarr, *Amer. Geol.*, Vol. XXXIII., 1904, pp. 271–291.

conclusion that the phenomena are the result of a double period of ice erosion.[6]

Of these facts the most important was the discovery of a series of buried gorges on the steepened slope in close association with the postglacial gorges or glens. In some cases the present stream has reoccupied these older gorges; in others it crosses them or follows them for only short distances. They are both broader and deeper than the postglacial gorges, and therefore required a longer period for their formation than has elapsed since the last ice recession. Being occupied by drift deposits of the last, or Wisconsin, ice advance, these gorges were evidently formed before the oncoming of this ice invasion. At first it was uncertain whether these gorges were of interglacial or preglacial age, though the former was strongly suspected.

A definite step toward the solution of the problem was made when it was discovered that in the Seneca Lake valley these older gorges do not extend below lake level. This is proved with especial definiteness on the western side of the Seneca valley, where for many miles there is a continuous rock outcrop along the shore just above lake level, and extending continuously across areas down which the older gorges must have passed. Watkins Glen illustrates this. The older, buried gorge leaves the Glen Creek valley just above the head of the postglacial glen a hundred yards or more above the point where the bridge of the Pennsylvania Division of the New York Central Railroad crosses the glen. It passes under the railway station and down the steepened main-valley slope under the sanitarium, its position there being indicated by a moderate sag in the hillslope, and, still better, by well borings at the sanitarium. Two wells, one at the sanitarium, the other a short distance west of it, fail to reach rock at 105 and 175 feet, respectively; but to both the north and the south of these wells rock is reached at depths of ten to twenty feet, proving the presence of a buried gorge. Below the sanitarium, along the line of this buried gorge, continuous rock outcrops occur, proving that the gorge is not continued there.

These facts prove that the buried gorges are also hanging, at Watkins fully 1,100 feet above the rock floor of the main valley.[7] The interpretation placed upon these facts is as follows: Before the glacial period there was a system of mature drainage, with main valleys along the axes of Seneca and Cayuga Lakes, and with tributaries entering them at grade at the level of the mouths of the hanging valleys, that is, at elevations of about 900 feet above present sea-level. The advent of

[6] Tarr, *Jour. Geol.*, Vol. XIV., 1906, pp. 18–21.

[7] A deep well at Watkins, 1,080 feet in depth, did not reach the rock bottom of the valley, striking the side of a cliff and bending the tool so that further boring was impossible.

the continental glacier buried this land beneath ice, which moved with especial freedom through the north-south valleys, scouring them and leaving them both broader and deeper. The amount of deepening by this ice invasion was at least five hundred feet, and probably much more, the exact amount being impossible of determination at present, since much of the evidence was erased by later ice erosion. Moreover, the first ice advance may have left lakes in the valleys, whose surfaces acted as temporary base-levels, below which the interglacial gorges could not be cut.

With the recession of this ice sheet, the upland tributaries were left hanging five hundred feet or more above the overdeepened main-valley bottom, and the streams descending the steepened main-valley slope began to cut gorges in it. This condition lasted through interglacial times and resulted in the production of fairly broad and deep gorges. Then came a readvance of the ice, which again broadened and deepened the valleys and on its recession left the interglacial gorges, partly buried and erased, hanging high above the newly made bottom of the main valley. Since the retreat of the Wisconsin ice sheet the streams have been engaged again in gorge cutting on the steepened slope, in some places along the lines of the older gorges, but more commonly partly or completely independent of them.

There are some facts which indicate possible greater complexity of ice erosion, for in some of the valleys there is apparently more than one buried gorge; but the evidence on this point is not as yet convincing, and for the present we can point with certainty to no greater complexity than that of two periods, one the Wisconsin, the other of some one of the earlier ice advances with which the work of the glacial geologists of the Mississippi valley have made us familiar.

The various glens of the Cayuga and Seneca Lake valleys, whose general cause is as above stated, differ greatly in detail. They are all wild and picturesque, and they are all narrow gorges with many cascades and waterfalls. Their variations depend upon the varying combinations of effects from several causes. One of these is the influence of the buried gorges. Wherever the postglacial stream enters one of these its valley abruptly broadens. Where the postglacial course coincides with the buried gorge the expansion is continuous; but where it merely crosses the older gorge, the narrow rock-walled and rock-bottomed postglacial gorge is replaced by an expansion, forming an 'amphitheater' with drift walls and bottom. The valley again contracts where the stream leaves the buried gorge and has cut a postglacial glen in the rock of the other wall of the older gorge.

A second cause for differences in the gorges is the influence of the variation in resistance to erosion of the nearly horizontal strata of Devonian shales and sandstones in which the gorges are cut. The

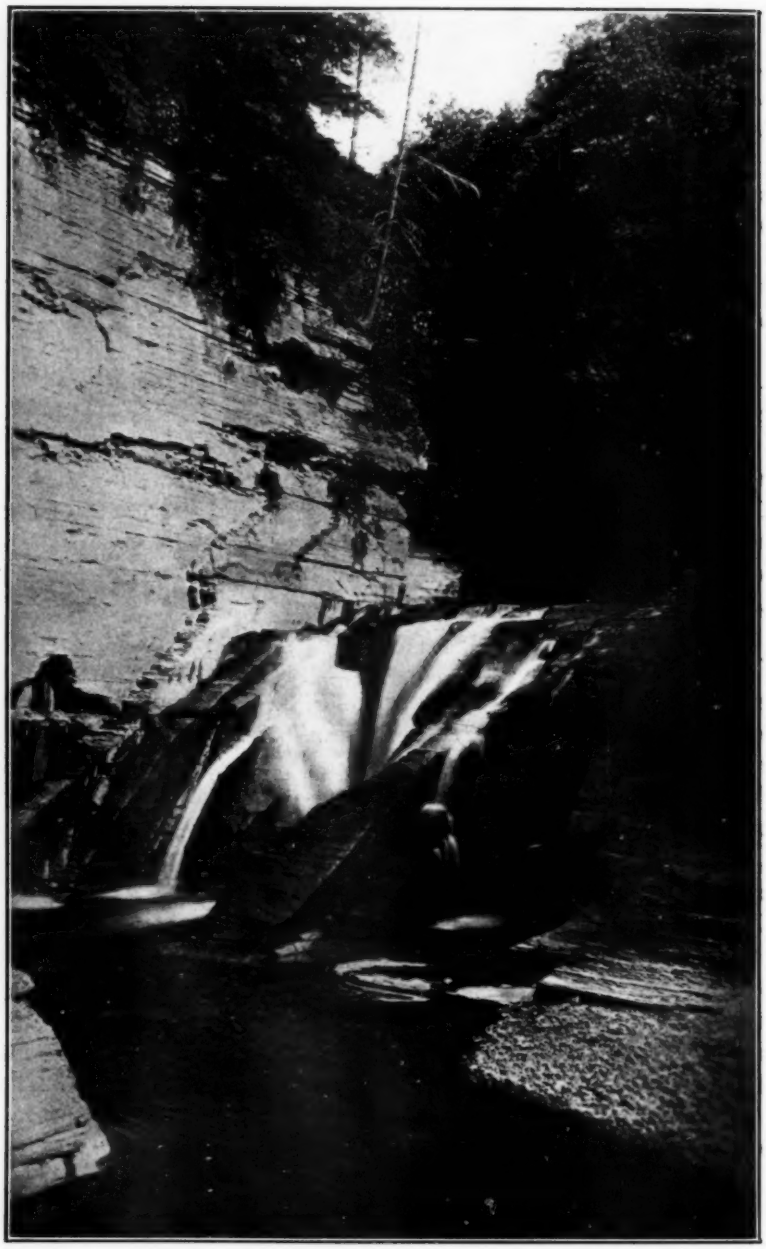

FIG. 8. GREENTREE FALLS IN SIX MILE CREEK, NEAR ITHACA, illustrating the influence of joint planes on gorge and waterfall form.

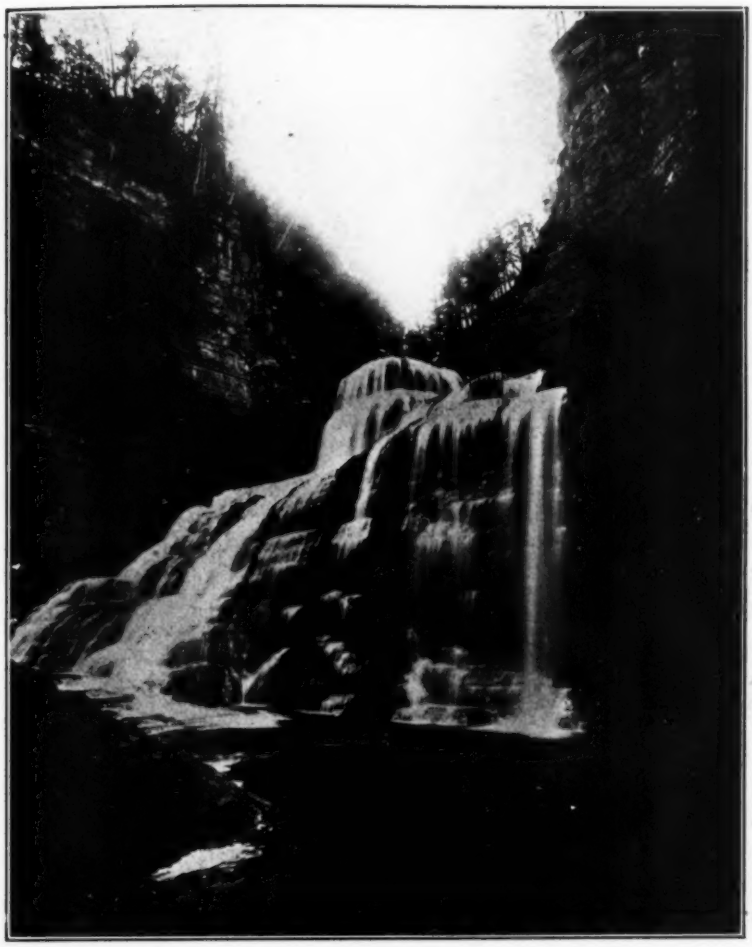

FIG. 9. STEP FALL IN ENFIELD (BUTTERNUT) CREEK, SOUTHWEST OF ITHACA, illustrating the influence of horizontal strata on waterfall form.

sandstone layers retard erosion and form falls, sometimes single leaps, sometimes step falls (Fig. 9) where the water cascades from ledge to ledge. With the variable spacing of the sandstone and shale layers, there is almost infinite variety in waterfall form.

The variation in gorge and waterfall form is still further increased by the joint planes which cleave the strata nearly vertically, and thus introduce a cause for vertical variation in erosion in addition to the horizontal. Some of the most beautiful of the cascades are those where the stream erosion has etched out combinations of horizontal and vertical irregularity in the rock bed over which the water falls (Fig. 8). The joint planes often guide the stream course between the falls also, sometimes confining it between narrow, canyon-

FIG. 10. POT-HOLES, WATKINS GLEN.

like walls with smooth, straight sides, sometimes leading the stream into sharply rectangular courses where the water departs from one set of joints to the other, which extends at right angles. Both the horizontal stratification and the vertical joint planes also affect the outline of the gorge walls, giving rise to some striking and picturesque effects.[8]

Still another feature prominently illustrated in these gorges is the pot-hole, formed where the cascading waters bore into the stream bed and, grinding pebbles about in the swirling waters, form large, deep pools (Fig. 10), adding interesting variety to the scenery of the gorges,

[8] For further description of these phenomena see Tarr, *Bull. Amer. Geog. Soc.*, Vol. XXXVII., 1905, pp. 193–212.

which at every turn have some new feature of interest or beauty. All these varied phenomena, but best of all the pot-holes, are illustrated with great clearness and variety in the wonderfully picturesque Watkins Glen.

From the standpoint of either the geographer, the geologist or the lover of scenery, a visit to any of these glens is well worth one's while; but no single one is so easily accessible, nor presents such a variety of phenomena, as Watkins Glen. Nearer centers of population it would be far more famous than now, and would be visited by scores of thousands. Waterfalls and gorges in Europe which can not be compared in beauty or interest with a score of glens in the Finger Lake region are far better known to the traveling American than Watkins Glen. It seems well, therefore, that it should be taken by the state, made better known, and opened freely to the public.

A LEAGUE OF PEACE[1]

By ANDREW CARNEGIE, Esq., LL.D.

Principal and Students of St. Andrews: My first words must be words of thanks, very grateful thanks, to those who have so kindly re-elected me their rector without a contest. The honor is deeply appreciated, I assure you. There is one feature, at least, connected with your choice, upon which I may venture to congratulate you, and also the university—the continuance of the services of my able and zealous assessor, Dr. Ross of Dunfermline, which I learn are highly valued.

My young constitutents, you are busily preparing to play your parts in the drama of life, resolved, I trust, to oppose and attack what is evil, to defend and strengthen what is good, and, if possible, to leave your part of the world a little better than you found it. You are already pondering over the career you will pursue, what problems you will study, upon what, and how, your powers can be most profitably exerted; and apart from the choice of a career I trust you ask yourselves what are the evils of this life, in which all our duties lie, which you should most strenuously endeavor to eradicate or at least to lessen, —what causes you will espouse, giving preference to these beyond all other public questions, for the student of St. Andrews is expected to devote both time and labor to his duties as a citizen, whatever his professional career. You will find the world much better than your forefathers did. There is profound satisfaction in this, that all grows better; but there is still one evil in our day, so far exceeding any other in extent and effect, that I venture to bring it to your notice.

Polygamy and slavery have been abolished by civilized nations. Duelling no longer exists where English is spoken. The right of private war and of privateering have passed away. Many other beneficent abolitions have been made in various fields; but there still remains the foulest blot that has ever disgraced the earth, the killing of civilized men by men like wild beasts as a permissible mode of settling international disputes, although in Rousseau's words, 'War is the foulest fiend ever vomited forth from the mouth of Hell.' As such, it has received from the earliest times, in each successive age till now, the fiercest denunciations of the holiest, wisest and best of men.

[1] A rectorial address delivered to the students in the University of St. Andrews, October 17, 1905.

Homer, about eight hundred and fifty years before Christ, tells us it is by no means fit for a man stained with blood and gore to pray to the gods, and that "Religious, social and domestic ties alike he violates, who willingly would court the honors of internal strife." ('Iliad,' IX., 63.)

He makes Zeus, the cloud-gatherer, look sternly at Ares, the God of War, saying: "Nay, thou renegade, sit not by me and whine. Most hateful art thou to me of all the Gods that dwell in Olympus; thou ever lovest strife, and wars and battles." ('Iliad,' V., line 891.)

Euripides, 480–406 B. C., cries, "Hapless mortals, why do ye get your spears and deal out death to fellow-men? Stay! from such work forbear!" . . . "Oh fools all ye who try to win the meed of valor through war, seeking thus to still this mortal coil, for if bloody contests are to decide, strife will never cease!"

Thucydides, who wrote his great work sometime between 423 B. C. and 403 B. C., asserts that "Wars spring from unseen and generally insignificant causes, the first outbreak being often but an explosion of anger." And he gives us the needed lesson for our day which should be accepted as an axiom: "It is wicked to proceed against him as a wrong-doer who is ready to refer the question to arbitration." Aristides praised Pericles, because, to avoid war, 'he is willing to accept arbitration.'

Andocides, about 440–388 B. C., says: "This then is the distinction, Athenians, which I draw between the two: peace means security for the people, war inevitable downfall."

Isocrates, 436–338 B. C., teaches that "Peace should be made with all mankind. It should be our care not only to make peace, but to maintain it. But this will never be until we are persuaded that quiet is better than disturbance, justice than injustice, the care of our own than grasping at what belongs to others." ('Oration on Peace.')

The sacred books of the east make peace their chief concern. "Thus does he (Buddha) live as a binder together of those who are divided, an encourager of those who are friends, a peacemaker, a lover of peace, impassioned for peace, a speaker of words that make for peace." ('Buddhist Suttas,' 5th century B. C.) "Now, wherein is his conduct good? Herein, that putting away the murder of that which lives, he abstains from destroying life. The cudgel and the sword he lays aside, and, full of modesty and pity, he is compassionate and kind to all creatures that have life." ('Buddhist Suttas.')

"Truly is the king our sovereign Lord! He has regulated the position of the princes; he has called in shields and spears; he has returned to their cases bows and arrows." ('The Shik King,' Decade I., Ode 10.)

Many hundred years before Christ, the Zendavesta pronounces 'Opposition to peace is a sin.'

The Buddhist commandment, six hundred years before our era, is 'Love all mankind equally.'

'To those of a noble disposition, the whole world is but one family,' says the Hindu.

Coming to the Romans, Cicero (106–43 B. C.) says: "War should only be undertaken by a highly civilized state to preserve either its religion or its existence." "There are two ways of ending a dispute—discussion and force: the latter manner is simply that of the brute beasts; the former is proper to beings gifted with reason." He also reminds the senate, "For in this assembly, before the matter was decided, I said many things in favor of peace, and even while war was going on I retained the same opinions, even at the risk of my own life." No better proof of the true patriot and leader can be given than this—a lesson much needed in our day.

Sallust (86–34 B. C.) recounts, "But after the Senate learned of the war between them, three young men were chosen to go out to Africa to both Kings, and in the words of the Senate, and of the people, announce to them that it was their will and advice that they lay down their arms and 'settle their disputes by arbitration rather than by the sword; since to act thus would be to the honor both of the Romans and themselves.'" ('Jugurtha,' XXI., 4.)

Virgil (70–19 B. C.) laments that "The love of arms and the mad wickedness of war are raging. . . . As for me, just come from war and reeking with fresh slaughter, it would be criminal for me to touch the gods till I shall have washed the pollution in the running stream."

From Seneca (4 B. C.–65 A. D.) we have this outburst: "We punish murders and massacres among private persons; what do we respecting wars, and the glorious crime of murdering whole nations?" . . . "The love of a conquest is a murderess. Conquerors are scourges not less harmful to humanity than floods and earthquakes."

Tacitus shrewdly observes, "To be sure every wicked man has the greatest power in stirring up tumult and discord; peace and quiet need the qualities of good men." ('Historiæ, IV., 1.) This is why the demagogue comes to the surface, to inflame the passions of the multitude, that he may ride to power upon them. Beware of the man who leads you into war.

Josephus, born only thirty-eight years after Christ, writes: "David said, 'I was willing to build God a temple myself, but he prohibited me, because I was polluted with blood and wars.'"

Plutarch, born 46 A. D., holds that "There is no war among men not born of wickedness; some are aroused by desire of pleasures, others by too great eagerness for influence and power."

Such are a few examples from the testimony of the ancients.

I now solicit your attention to the views held and expressed by the early christian fathers, which can not but be of special importance to such of you as are theological students.

Justin Martyr, who died about 165 A. D., proclaims, "That the prophecy is fulfilled we have good reason to believe, for we (Christians), who in the past killed one another, do not now fight our enemies."

St. Irenæus, about 140–202 A. D., boasts that "The Christians have changed their swords and their lances into instruments of peace, and they know not how to fight."

Clement of Alexandria, whose works were composed in the end of the second century and beginning of the third, writes, 'The followers of Christ use none of the implements of war.'

Tertullian, about 150–230 A. D., asks, "How shall a Christian go to war, how shall he carry arms in time of peace, when the Lord has forbidden the sword to us? . . . Jesus Christ, in disarming St. Peter, disarmed all soldiers." ('De Idololatr.,' 19.) "The military oath and the baptismal vow are inconsistent with each other, the one being the sign of Christ, the other of the Devil." . . . "Shall it be held lawful to make an occupation of the sword, when the Lord proclaims that he who uses the sword shall perish by the sword?"

Origen, 185–254 A. D., says, "The angels wonder that peace is come through Jesus to earth, for it is a place ridden with wars." "This is called peace, where none is at variance, nothing is out of harmony, where there is nothing hostile, nothing barbarian." "For no longer do we (Christians) take arms against any race, or learn to wage war, inasmuch as we have been made sons of peace through Jesus, whom we follow as our leader." ('Patrologia Græca,' XIV., pp. 46, 988, 1231.)

St. Cyprian, about 200–257 A. D., boasts that "Christians do not in turn assail their assailants, since it is not lawful for the innocent even to kill the guilty; but they readily deliver up their lives and blood." (Epistle 56, to Cornelius, section 2.)

Arnobius, who wrote about 295 A. D., says, "Certainly, if all who look upon themselves as men would listen awhile unto Christ's wholesome and peaceable decrees, the whole world long ago, turning the use of iron to milder works, should have lived in most quiet tranquility, and have met together in a firm and indissoluble league of most safe concord." ('Adversus Gentes,' Lib. I., page 6.)

Lactantius, who wrote in the beginning of the fourth century, insists that "It can never be lawful for a righteous man to go to war, for his warfare is unrighteous itself." "It is not murder that God rebukes; the civil laws punish that. God's prohibition is intended for those acts which men considered lawful. Therefore it is not permitted

for a Christian to bear arms; justice is his armor. The divine command admits no exceptions; man is sacred and it is always a crime to take his life." ('Div. Inst.,' VI., 20.) Thus does he declaim against men-slayers: "This, then, is your road to immortality. To destroy cities, devastate territories, exterminate or enslave free peoples! The more you have ruined, robbed, and murdered men, the more you think yourselves noble and illustrious." ('Div. Inst.,' I., 48.)

Athanasius, 296–373 A. D., states that when people "hear the teaching of Christ, straightway instead of fighting they turn to husbandry, and instead of arming their hands with weapons they raise them in prayer." ('Incarnation of the Word,' section 52.)

St. Gregory of Nyssa, 335–395 A. D., preaches that "He who promises you profit, if you abstain from the ills of war, bestows on you two gifts—one the remission from the train of evils attendant on the strife, the other the strife itself." ('Patrologia Græca,' XLIV., p. 1282.)

St. Augustine, 354–430 A. D., declares that 'Not to keep peace is to spurn Christ.' ('Migne's Patrologia Latina,' XXXIII., p. 186.) He holds that 'defensive wars are the only just and lawful ones; it is in these alone that the soldier may be allowed to kill, when he can not otherwise protect his city and his brethren.' (Letter 47.)

Isidore of Pelusium, 370–450 A. D., is no less outspoken: "I say, although the slaughter of enemies in war may seem legitimate, although the columns to the victors are erected, telling of their illustrious crimes, yet if account be taken of the undeniable and supreme brotherhood of man, not even these are free from evil." ('Patrologia Græca,' LXXVIII., p. 1287.)

We have also the undisputed historical record of Maximilian, the centurion, who, having embraced christianity, resigned his position and refused to fight. For this he was put to death.

Celsus, the great opponent of christianity, who wrote about 176 A. D., reproaches the christians for refusing to bear arms, and states that in one part of the Roman army, including one-third of the whole, 'Not a Christian could be found.'

Martin replied to Julian, the apostate, 'I am a Christian, and I can not fight.'

If we turn to the Popes, who were then supreme:

St. Gregory the Great, 540–604 A. D., writes the King of the Lombards, 'By choosing peace you have shown yourself a lover of God who is its author.'

Pope Innocent III., to the King of France, in protest against the wars between Philip Augustus and Richard of England, writes, "At the moment when Jesus Christ is about to complete the mystery of redemption, he gives peace as a heritage to his disciples; he wills that

they observe it among themselves and make it observed by others. What he says at his death, he confirms after his resurrection. 'Peace be with you.' These are the first words which he addressed to his Apostles. Peace is the expression of that love which is the fulfilling of the law. What is more contrary to love than the quarrels of men? Born of hate, they destroy every bond of affection; and shall he who loves not his neighbour love God?"

Erasmus declares, "If there is in the affairs of mortal men any one thing which it is proper to explode, and incumbent upon every man by every lawful means to avoid, to deprecate, to oppose, that one thing is doubtless war."

Luther declares, "Cannons and firearms are cruel and damnable machines. I believe them to have been the direct suggestion of the Devil. If Adam had seen in vision the horrible instruments his children were to invent, he would have died of grief."

Nothing can be clearer than that the leaders of christianity immediately succeeding Christ, from whom authentic expressions of doctrines have come down to us, were well assured that their Master had forbidden to the christian the killing of men in war or enlisting in the legions. One of the chief differences which separated Roman non-christians and christians was the refusal of the latter to enlist in the legions and be thus bound to kill their fellows in war as directed. We may well ponder over the change, and wonder that christian priests accompany the armies of our day, and even dare to approach the Unknown, beseeching his protection and favor for soldiers in their heinous work. When the warring hosts are christian nations, worshipping the one God, which, alas, is not seldom, as in the last gigantic orgy of human slaughter in Europe, we had the spectacle of the rival priests, praying in the name of the Prince of Peace, to the God of Battles for favor. Similar prayers were offered in the churches, where in some instances battle-flags, the emblems of carnage, were displayed. Future ages are to pronounce all this blasphemous. There are those of to-day who deplore it deeply. Even the pagan, before Christ, direct from human butchery, refrained from appealing to his gods without first cleansing himself of the accruing pollution.

It is a truism that the doctrines of all founders of religions have undergone modifications in practise, but it is strange indeed that the doctrine of Christ regarding war and warriors, as held by his immediate followers, should have been so completely discarded and reversed in the later centuries, and is so still.

Bentham's words can not be overlooked: "Nothing can be worse than the general feeling on the subject of war. The church, the state, the ruling few, the subject man, all seem in this case to have combined to patronize vice and crime in their widest sphere of evil.

Dress a man in particular garments, call him by a particular name, and he shall have authority, on divers occasions, to commit every species of offense—to pillage, to murder, to destroy human felicity; and for so doing he shall be rewarded. The period will surely arrive when better instructed generations will require all the evidence of history to credit that, in times deeming themselves enlightened, human beings should have been honored with public approval in the very proportion of the misery they caused."

Bacon's words come to mind: "I am of opinion that, except you bray christianity in a mortar and mould it into new paste, there is no possibility of a holy war."

Apparently in no field of its work in our times does the christian church throughout the whole world, with outstanding individual exceptions of course, so conspicuously fail as in its attitude to war—judged by the standard maintained by the early christian fathers nearest in time to Christ. Its silence when outspoken speech might avert war, its silence during war's sway, its failure even during calm days of peace to proclaim the true christian doctrine regarding the killing of men made in God's image, and the prostitution of its holy offices to unholy warlike ends, give point to the recent arraignment of Prime Minister Balfour, who declared that the church to-day busies itself with questions which do not weigh even as dust in the balance compared with the vital problems with which it is called upon to deal.

Volumes could be filled with the denunciations of war by the great moderns. Only a few can be given.

Lord Clarendon, 1608–1674, says, "We can not make a more lively representation and emblem to ourselves of hell, than by the view of a kingdom in war."

Hume says, "The rage and violence of public war, what is it but a suspension of justice among the warring parties?"

Gibbon writes, "A single robber or a few associates are branded with their genuine name; but the exploits of a numerous band assume the character of lawful and honorable war."

'In every battlefield we see an inglorious arena of human degradation,' says Conway.

A strong voice from a St. Andrews principal is heard. Sir David Brewster, 1781–1868, says, "Nothing in the history of the species appears more inexplicable than that war, the child of barbarism, should exist in an age enlightened and civilized. But it is more inexplicable still that war should exist where christianity has for nearly 2,000 years been shedding its gentle light, and should be defended by arguments drawn from the Scriptures themselves."

One of the greatest American secretaries of state, Colonel John Hay, who has just passed away, denounced war as 'the most futile and ferocious of human follies.'

Much has man accomplished in his upward march from savagery. Much that was evil and disgraceful has been banished from life; but the indelible mark of war still remains to stain the earth and discredit our claim to civilization. After all our progress, human slaughter is still with us; but I ask your attention for a few minutes to many bright rays, piercing the dark cloud, which encourage us. Consider for a moment what war was in days past. It knew no laws, had no restrictions. Poison and assassination of opposing rulers and generals arranged by private bargain, and deceptive agreements, were legitimate weapons. Prisoners were massacred or enslaved. No quarter was given. Enemies were tortured and mutilated. Women, children and non-combatants were not spared. Wells were poisoned. Private property was not respected. Pillage was the rule. Privateering and private war were allowed. Neutral rights at sea were almost unknown.

Permit me briefly to trace the history of the reforms in war which have been achieved, from which we draw encouragement to labor for its abolition, strong in the faith that the days of man-slaying are numbered.

The first action against the savage custom of war is found in the rules of the Amphictyonic Council of the Greeks, some three hundred years before Christ. Hellenes were 'to quarrel as those who intend some day to be reconciled.' They were to "use friendly correction, and not to devastate Hellas or burn houses, or think that the whole population of a city, men, women and children, were equally their enemies and therefore to be destroyed."

We owe chiefly to Grotius the modern movement to subject hitherto lawless war on land and sea to the humane restraints of law. His first book, 'Mare Liberum,' appeared in 1609. It soon attracted such attention that Britain had to employ her greatest legal authority, Lord Selden, to make reply. Up to this time Spain, Portugal and Britain had maintained that the surrounding seas were closed to all countries except those upon their shores, a doctrine not formally abandoned by Britain until 1803.

Grotius's second and epoch-making work, 'The Rights of War and Peace,' appeared in 1625, and immediately arrested the attention of Gustavus Adolphus, the greatest warrior of his time. A copy was found in his tent when he died on the field of Lützen. He stood constantly for mercy, even in those barbarous days. Three years after its appearance, Cardinal Richelieu, to the amazement of Europe, spared the Huguenot garrison, and protected the city of Rochelle, when he was expected to follow the usual practise of massacring the defenders and giving the town and inhabitants over to massacre and pillage. It was then holy work to slay heretics, sparing not one. He was denounced for this merciful act by his own party and hailed as 'Cardinal

of Satan' and 'Pope of the Atheists.' The Treaty of Westphalia in 1648, three years after the death of Grotius, closed the Thirty Years War in Germany, the Eighty Years' War in the Netherlands, and a long era of savagery in many parts of the globe. It shows clearly the influence of Grotius's advanced ideas, being founded upon his doctrine of the essential independence and equality of all sovereign states, and the laws of justice and mercy. In the progress of man from war, lawless and savage, to war restricted and obedient to international law, no name is entitled to rank with his. He is the father of modern international law, so far as it deals with the rights of peace and war. He has had several eminent successors, especially Puffendorf, Bynkershoek and Vattel. These four are called by Phillimore 'The Umpires of International Disputes.' They are followed closely by a second quartette, the British judge—Stowell, and the American judges —Marshall, Story and Field.

International law is unique in one respect. It has no material force behind it. It is a proof of the supreme force of gentleness—the irresistible pressure and final triumph of what is just and merciful. To the few who have contributed conspicuously to its growth in the past, and to those laboring therein to-day, civilization owes an unpayable debt. Private individuals have created it, and yet the nations have been glad to accept. British judges have repeatedly declared that 'International law is in full force in Britain.' It is so in America and other countries. We have in this self-created, self-developing and self-forcing agency one of the two most powerful and beneficent instruments for the peace and progress of the world.

The most important recent reforms effected in the laws of war are those of the Treaty of Paris (1856), the Treaty of Washington (1871), which settled the Alabama Claims, and the Brussels Declaration of 1874.

The Treaty of Paris marks an era as having enshrined certain principles. First, it abolished privateering. Henceforth, war on the sea is confined to national warships, organized and manned by officers and men in the service of the state. Commerce is no longer subject to attack by private adventurers seeking spoil. Second, it ruled that a blockade to be recognized must be effective. Third, it established the doctrine that an enemy's goods in a neutral ship are free, except contraband. These were great steps forward.

America declined to accept the first (in which, however, she has now concurred) unless private property was totally exempt on sea as on land, for which she has long contended, and which the powers, except Britain, have generally favored. So strongly has the current set recently in its favor that hopes are entertained that the forthcoming conference at The Hague may reach this desirable result. It is the

final important advance in this direction that remains to be made, and means that peaceful commerce has been rescued from the demon war. Should it be made, the trenchers of St. Andrews students may well whirl in the air with cheers.

The Treaty of Washington is probably to rank in history as Mr. Gladstone's greatest service, because it settled by arbitration the Alabama Claims, a question fraught with danger, and which, if left open, would probably have driven apart and kept hostile to each other for a long period the two branches of the English-speaking race. A statesman less powerful with the great masses of his countrymen could not have carried the healing measure, for much had to be conceded by Britain, for which it deserves infinite credit. Three propositions were insisted upon by America as a basis for arbitration, and although all were reasonable and should have been part of international law, still they were not. Their fairness being recognized, Mr. Gladstone boldly and magnanimously agreed that the arbiters should be guided by them. These defined very clearly the duties of neutrals respecting the fitting out of ships of war in their ports, or the use of their ports as a naval base. This they must now use 'due diligence' to prevent.

Morley says, in his Life of Gladstone: "The Treaty of Washington and the Geneva arbitration stand out as the most noble victory in the 19th century of the noble art of preventive diplomacy, and the most signal exhibition in their history of self-command in two of three chief democratic powers of the Western World."

The Brussels Convention met in 1874.

Even as late as the earlier half of last century the giving up of towns and their inhabitants to the fury of the troops which stormed them was permitted by the usages of war. Defending his conduct in Spain, Wellington says: "I believe it has always been understood that the defenders of a fortress stormed have no right to quarter." After the storming of San Sebastian, as to plunder, he says: "It has fallen to my lot to take many towns by storm, and I am concerned to add that I never saw nor heard of one so taken by any troops that it was not plundered."

Shakespeare's description of the stormed city can never be forgotten:

> The gates of mercy shall be all shut up,
> And the flushed soldier rough and hard
> In liberty of bloody hand shall range
> With conscience wide as hell.

This inhuman practise was formally abolished by the Brussels Declaration—that 'a town taken by storm shall not be given up to the victorious troops to plunder.' To-day to put a garrison to the sword would be breach of the law of quarter, as well as a violation of

the Brussels Declaration. We may rest assured the civilized world has seen the last of that atrocity.

We look back from the pinnacle of our high civilization with surprise and horror to find that even in Wellington's time, scarcely one hundred years ago, such savagery was the rule; but so shall our descendants after a like interval look back from a still higher pinnacle upon our slaying of man in war as equally atrocious, equally unnecessary and equally indefensible.

Let me summarize what has been gained so far in mitigating the atrocities of war in our march onward to the reign of peace. Noncombatants are now spared, women and children are no longer massacred, quarter is given, and prisoners are well cared for. Towns are not given over to pillage, private property on land is exempt, or if taken is paid or receipted for. Poisoned wells, assassination of rulers and commanders by private bargain, and deceptive agreements, are infamies of the past. On the sea, privateering has been abolished, neutral rights greatly extended and property protected, and the right of search narrowly restricted. So much is to be credited to the pacific power of international law. There is great cause for congratulation. If man has not been striking at the heart of the monster war, he has at least been busily engaged drawing some of its poisonous fangs.

Thus even throughout the savage reign of man-slaying we see the blessed law of evolution unceasingly at work performing its divine mission, making that which is better than what has been and ever leading us on towards perfection.

We have only touched the fringe of the crime so far, however, the essence of which is the slaughter of human beings, the failure to hold human life sacred, as the early christians did.

One deplorable exception exists to the march of improvement. A new stain has recently crept into the rules of war as foul as any that war has been forced by public sentiment to discard. It is the growth of recent years. Gentilis, Grotius and all the great publicists before Bynkershoek, dominated by the spirit of Roman law, by chivalry and long established practise, insist upon the necessity of a formal declaration of war, 'that he be not taken unawares under friendly guise.' Not until the beginning of the last century did the opposite view begin to find favor. To-day it is held that a formal declaration is not indispensable and that war may begin without it. Here is the only step backward to be met with in the steady progress of reforming the rules of war. It is no longer held to be contrary to these for a power to surprise and destroy while yet in friendly conference with its adversary, endeavoring to effect a peaceful settlement. It belongs to the infernal armory of assassins hired to kill or poison opposing generals, of forged

despatches, poisoned wells, agreements made to be broken and all the diabolic weapons which, for very shame, men have been forced to abandon as too infamous even for the trade of man-slaying. It proclaims that any party to a dispute can first in his right hand carry gentle peace, sitting in friendly conference, ostensibly engaged in finding a peaceful solution of differences, while with the left he grasps, concealed, the assassin's dagger. The parallel between duel and war runs very close through history. The challenger to a duel gave the other party notice. In 1187, the German diet at Nuremberg enacted, "We decree and enact by this edict that he who intends to damage another or to injure him shall give him notice three days before." It is to be hoped that the coming conference will stamp this treachery as contrary to the rules of war, and thus return to the ancient and more chivalrous idea of attack only after notice.

We come now to the consideration of the other commanding force in the campaign against war—peaceful arbitration.

The originator of the world-wide arbitration idea was Emeric Cruce, born at Paris about 1590. Of his small book of 226 pages upon the subject only one copy exists. Gerloius had propounded the idea in the 12th century, but it failed to attract attention. Balch says, "Cruce presented what was probably the first real proposal of substituting international arbitration for war as the court of last resort of nations." It has a quaint preface: "This book would gladly make the tour of the inhabited world so as to be seen by all the kings, and it would not fear any disgrace, having truth for its escort and the merit of its subject, which must serve as letters of recommendation and credit."

Henry IV., in 1603, produced his scheme for consolidating Europe in order to abolish war; but as its fundamental idea was armed force and involved the overthrow of the Hapsburgs, it can not be considered as in line with the system of peaceful arbitration.

St. Pierre, the Duc de Lorraine, William Penn, the Quaker founder of Pennsylvania, Bentham, Kant, Mill and others have labored to substitute the reign of law for war by producing schemes much alike in character, so that we have many proofs of the irrepressible longing of man for release from the scourge.

I beg now to direct your attention to the most fruitful of all conferences that have ever taken place. Other conferences have been held, but always at the end of war, and their first duty was to restore peace between the belligerents. The Hague conference was the first ever called to discuss the means of establishing peace without reference to any particular war. Twenty-six nations were represented, including all the leading powers.

The conference was called by the present Emperor of Russia, August 24, 1898, and is destined to be forever memorable from having

realized Cruce's ideal, and given to the world its first permanent court for the settlement of international disputes. The last century is in future ages to remain famous as having given birth to this high court of humanity. The conference opened upon the birthday of the Emperor, May 18th, 1899. The day may yet become one of the world's holidays in the coming day of peace, as that upon which humanity took one of its longest and highest steps in its history, onward and upward. As Ambassador White says, 'The Conference marks the first stage in the abolition of the scourge of war.' Such an achievement was scarcely expected, even by the most sanguine. Its accomplishment surprised most of the members of the conference themselves; but so deeply and generally had they been appalled by the ravages of war, and its enormous cost, by its inevitable progeny of future wars, and above all by its failure to ensure lasting peace, that the idea of a world court captivated the assembly, which has been pronounced the most distinguished that ever met. A less sweeping proposal would probably not have touched their imagination and aroused their enthusiasm. The prompt acceptance of the international court by public sentiment in all countries was no less surprising. Every one of the powers represented promptly ratified the treaty, the United States Senate voting unanimously—a rare event. We may justly accept this far-reaching and rapid success as evidence of a deep, general and earnest desire in all lands to depose war and enthrone peace through the judicial settlement of disputes by courts.

At last there is no excuse for war. A tribunal is now at hand to judge wisely and deliver righteous judgment between nations. It has made an auspicious start. A number of disputes have already been settled by it. First, it settled a difference between the United States and Mexico. Then President Roosevelt, when asked to act as arbiter, nobly led Britain, Germany, France, Italy, America and Venezuela to it for settlement of their differences, which has just been concluded.

Britain had recently a narrow escape from war with Russia, arising from the unfortunate incident upon the Dogger Bank, when fishing boats were struck by shots from Russian war-ships. There was intense excitement. The Hague Treaty provides that when such difficulties arise international commissions of inquiry be formed. This was the course pursued by two governments, parties to the treaty, which happily preserved the peace.

It was under another provision of the Hague conference that the President of the United States addressed his recent note to Japan and Russia suggesting a conference looking to peace, and offering his services to bring it about. His success was thus made possible by the Hague Treaty. The world is fast awakening to its far-reaching consequences and to the fact that the greatest advance man has ever made

by one act is the creation of a world court to settle international disputes.

As I write, report comes that to-morrow the august tribunal is to begin hearing France and Britain upon their differences regarding Muscat. There sits the divinest conclave that ever graced the earth, judged by its mission, which is the fulfilment of the prophecy, "Men shall beat their swords into ploughshares, and their spears into pruning hooks; nation shall not lift up sword against nation, neither shall they learn war any more."

Thus the world court goes marching on, to the dethronement of savage war and the enthronement of peaceful arbitration.

The Hague tribunal has nothing compulsory about it; all members are left in perfect freedom as to whether they submit questions to it or not. This has sometimes been regarded as its weakness, but it is, from another point of view, its strongest feature. Like international law, it depends upon its merits to win its way, and, as we have seen, it is succeeding; but so anxious are many to hasten the abolition of war that suggestions are made towards obtaining the consent of the powers to agree to submit to it certain classes of questions. In this it may be well to make haste slowly and refrain from exerting pressure. This will all come in good time. Peace wins her way not by force; her appeal is to the reason and the conscience of man. In all treaties hitherto the great powers have retained power to withhold submission of questions affecting 'their honor or vital interests.' This was only natural at first, and time is required gradually to widen the range of subjects to be submitted. The tendency to do this is evident, and it only needs patience to reach the desired end. The greatest step forward in this direction is that Denmark and the Netherlands and Chili and Argentina have just concluded treaties agreeing to submit to arbitration all disputes, making no exception whatever. To crown this noble work, the latter two have erected a statue to the Prince of Peace on the highest peak of the Andes, which marks the long-disputed boundary between them.

Another splendid advance in this direction has been made in the agreement to arbitrate all questions between Sweden and Norway. Questions affecting 'independence, integrity or vital interests' are excepted; but should any difference arise as to what to do, that question is to be submitted. In other words, either nation can claim that a question does so, and, if the Hague tribunal agrees, it is not arbitrated. But if the tribunal decides the difference does not concern the 'independence, integrity or vital interests of either country,' then it is submitted to arbitration. This is certainly a step forward; and you will please note that intangible thing—'honor'—is omitted.

These nations are to be cordially congratulated on taking the initial

step in this splendid advance. We grudge not the honor and glory that have fallen to them therefrom, though in our hearts we may feel that this might more appropriately have been the work of the race that abolished slavery, both branches participating, and also abolished the duel. What our race should now do is to follow the example set and conclude such a treaty, operative within the wide boundaries of English-speakers, empire and republic. Less than this were derogatory to our past as pioneers of progress. We can not long permit these small nations to march in advance. We should at least get abreast of them.

We have noted that honor or vital interests have hitherto been excepted from submission by arbitration treaties. We exclaim, 'Oh, Liberty, what crimes are committed in thy name!'—but these are trifling compared with those committed in the name of 'honor,' the most dishonored word in our language. Never did man or nation dishonor another man or nation. This is impossible. All honor's wounds are self-inflicted. All stains upon honor come from within, never from without. Innocence seeks no revenge; there is nothing to be revenged—guilt can never be. Man or nation whose honor needs vindication beyond a statement of the truth, which puts calumny to shame, is to be pitied. Innocence rests with that, truth has a quiet breast, for the guiltless find that

> So dear to heaven is saintly innocence,
> A thousand liveried angels lackey her
> To keep her from all sense of sin and shame.

Innocent honor, assailed, discards bloody revenge and seeks the halls of justice and of arbitration. It has been held in the past that, a man's honor assailed, vindication lay only through the sword. To-day it is sometimes still held that a nation's honor, assailed, can in like manner be vindicated only through war; but it is not open to a member of our race to hold this doctrine, for within its wide boundaries no dispute between men can be lawfully adjusted outside the courts of law. Instead of vindicating his honor, the English-speaking man who violated the law by seeking redress by personal violence would dishonor himself. Under our law, no wrong against man can be committed that justifies the crime of private vengeance after its commission.

The man of our race who holds that his country would be dishonored by agreeing to unrestricted arbitration forgets that according to this standard he is personally dishonored by doing that very thing. Individually he has become civilized, nationally he remains barbaric, refusing peaceful settlement and insisting upon national revenge—all for injured honor.

Which of us would not rejoice to have Britain and America share with Denmark and Holland, Chili and Argentina, the 'dishonor' they have recently incurred, and esteem it a proud possession?

Nations are only aggregates of the individual. The parallel between war and the duel is complete; and as society within our race already relies upon courts of justice to protect its members from all wrongs, so shall the nations finally rely upon international courts.

Objection has been made that unreasonable, dishonoring or baseless claims might be made under arbitration. That any member of the family of nations would present a claim wholly without basis, or that the court would not decide against it if made, is a danger purely hypothetical. The agreement between nations when made will undoubtedly be framed in accordance with the ideas of Grotius, and the independence and equality of all members and their existing territories recognized. These could not be assailed.

Three incidents have occurred since the court was organized which have caused much pain to the friends of peace throughout the world.

America refused the offer of the Filipinos to adjust their quarrel by arbitration. Britain refused the offer of the Transvaal Republic to arbitrate, although three of the court proposed by the republic were to be British judges, and the other two judges of Holland—the most remarkable offer ever made, highly creditable to the maker and a great tribute to British judges. Neither Russia nor Japan suggested submission to The Hague. Since the Hague Court is the result of the Russian Emperor's initiative, this caused equal surprise and pain. The explanation has been suggested that peaceful conferences were being held when Japan attacked at Port Arthur without notice, rendering arbitration impossible.

We must recognize these discouraging incidents, but we have the consolation left us of believing that, had either of the three nations seen, at the beginning, the consequences of ignoring arbitration, as clearly as they did later, they would have accepted arbitration and had reason to congratulate themselves upon the award of the court, whatever it was. They will learn by experience. Notwithstanding these regrettable failures to refer disputes to the Hague Court as peaceful umpire, we have abundant reason for satisfaction in the number of instances in which the court's award has already brought peace without the sacrifice of one human life—the victories which bring no tears.

Signs of action in favor of universal peace abound. Among these may be mentioned that the Inter-Parliamentary Union assembled at St. Louis last year requested the governments of the world to send representatives to an international conference to consider:—*First,* the questions for the consideration of which the conference at the Hague expressed a wish that a future conference be called. *Second,* the negotiation of arbitration treaties between the nations represented. *Third,* the advisability of establishing an international congress to be convened periodically for the discussion of international questions.

President Roosevelt invited the nations to call the conference, but has recently deferred to the Emperor of Russia as the proper party to call the nations together again.

Should the proposed periodic congress be established, we shall have the germ of the council of nations, which is coming to keep the peace of the world, judging between nations, as the Supreme Court of the United States judges to-day between states embracing an area larger than Europe. It will be no novelty, but merely an extension of an agency already proved upon a smaller scale. As we dwell upon the rapid strides towards peace which man is making, the thought arises that there may be those now present, who will live to see this world council established, through which is sure to come in the course of time the banishment of man-slaying among civilized nations.

I hope my hearers will follow closely the proceedings of the Hague conference, for upon its ever-extending sway largely depends the coming of the reign of peace. Its next meeting will be important, perhaps epoch-making. Its creation and speedy success prepare us for surprisingly rapid progress. Even the smallest further step taken in any peaceful direction would soon lead to successive steps thereafter. The tide has set in at last, and is flowing as never before for the principle of arbitration as against war.

So much for the temple of peace at The Hague. Permit me a few words upon arbitration in general.

The statesmen who first foresaw and proved the benefits of modern arbitration were Washington, Franklin, Hamilton, Jay and Grenville.

As early as 1780 Franklin writes, "We make daily great improvements in Natural, there is one I wish to see in Moral, Philosophy—the discovery of a plan that would induce and oblige nations to settle their disputes without first cutting each other's throats." His wish was realized in the Jay Treaty of 1794, from which modern arbitration dates. It is noteworthy that this treaty was the child of our race and that the most important questions which arbitration has settled so far have been those between its two branches.

It may surprise you to learn that from the date of the Jay Treaty, one hundred and eleven years ago, no less than five hundred and seventy-one international disputes have been settled by arbitration. Not in any case has an award been questioned or disregarded, except, I believe, in one case, where the arbiters misunderstood their powers. If in every ten of these differences so quietly adjusted without a wound, there lurked one war, it follows that peaceful settlement has prevented fifty-seven wars—one every two years. More than this, had the fifty-seven wars, assumed as prevented by arbitration, developed, they would have sown the seeds of many future wars, for there is no such prolific mother of wars as war itself. Hate breeds hate, quarrel breeds quarrels,

war breeds war—a hateful progeny. It is the poorest of all remedies. It poisons as it cures. No truer line was ever penned than this of Milton's, 'For what can war but endless war still breed?'

No less than twenty-three international treaties of arbitration have been made within the past two years. The United States made ten with the principal powers, which only failed to be formally executed because the senate, which shares with our executive the treaty-making power to the extent that its approval is necessary, thought it advisable to change one word only—'treaty' for 'agreement'—which proved unsatisfactory to the executive. The vote of the senate was almost unanimous, showing an overwhelming sentiment for arbitration. The internal difference will no doubt be adjusted.

You will judge from these facts how rapidly arbitration is spreading. Once tried, there is no backward step. It produces peace and leaves no bitterness. The parties to it become better friends than before; war makes them enemies.

Much has been written upon the fearful cost of war in our day, the ever-increasing blood tax of nations, which threatens soon to approach the point of exhaustion in several European lands. To-day France leads with an expenditure of £3 14s and a debt of £31 3s 8d per head. Britain follows with an annual expenditure of £3 8s 8d and a debt of £18 10s 5d per head. Germany's expenditure is in great contrast—only £1 15s 4d, not much more than one-third; her debt, £2 12s 2d, not one-sixth that of Britain. Russia's expenditure is £1 14s 6d, about the same as the German; her debt £5 9s 9d per head.

The military and naval expenditure of Britain is fully half of her total expenditure; that of the other great powers, though less, is rapidly increasing.

All the great national debts, with trifling exceptions—Britain's eight hundred millions, France's twelve hundred millions sterling—are the legacies of war.

This drain, with the economic loss of life added, is forcing itself upon the nations concerned as never before. It threatens soon to become dangerous unless the rapid increase of recent years be stopped; but it is to be feared that not till after the financial catastrophe occurs will nations devote themselves seriously to apply the cure.

The futility of war as a means of producing peace between nations has often been dwelt upon. It is really the most futile of all remedies, because it embitters contestants and sows the seeds of future struggles. Generations are sometimes required to eradicate the hostility engendered by one conflict. War sows dragons' teeth, and seldom gives to either party what it fought for. When it does, the spoil generally proves Dead Sea fruit. The terrible war just concluded is another case in point. Neither contestant obtained what he fought for, the

reputed victor being most of all disappointed at last with the terms of peace. Had Japan, a very poor country, known that the result would be a debt of two hundred millions sterling loading her down, or had Russia known the result, differences would have been peacefully arbitrated. Such considerations find no place, however, in the fiery furnace of popular clamor; as little do those of cost or loss of life. Only if the moral wrong, the sin in itself, of man-slaying is brought home to the conscience of the masses may we hope speedily to banish war. There will, we fear, always be demagogues in our day to inflame their brutal passions and urge men to fight, as a point of honor and patriotism, scouting arbitration as a cowardly refuge. All thoughts of cost or loss of human life vanish when the brute in man, thus aroused, gains sway.

It is the crime of destroying human life by war and the duty to offer or accept peaceful arbitration as a substitute which need to be established, and which, as we think, those of the church, the universities, and of the professions are called upon to strongly emphasize.

If the principal European nations were not free through conscription from the problem which now disturbs the military authorities of Britain, the lack of sufficient numbers willing to enter the man-slaying profession, we should soon hear the demand formulated for a league of peace among the nations. The subject of war can never be studied without recalling this simplest of all modes for its abolition. Five nations cooperated in quelling the recent Chinese disorders and rescuing their representatives in Pekin. It is perfectly clear that these five nations could banish war. Suppose even three of them formed a league of peace—inviting all other nations to join—and agreed that since war in any part of the civilized world affects all nations, and often seriously, no nation shall go to war, but shall refer international disputes to the Hague conference or other arbitral body for peaceful settlement, the league agreeing to declare non-intercourse with any nation refusing compliance. Imagine a nation cut off to-day from the world. The league also might reserve to itself the right, where non-intercourse is likely to fail or has failed to prevent war, to use the necessary force to maintain peace, each member of the league agreeing to provide the needed forces, or money in lieu thereof, in proportion to her population or wealth. Being experimental and upon trial, it might be deemed advisable, if necessary, at first to agree that any member could withdraw after giving five years' notice, and that the league should dissolve five years after a majority vote of all the members. Further provisions, and perhaps some adaptations, would be found requisite, but the main idea is here.

The Emperor of Russia called the Hague conference, which gave us an international tribunal. Were King Edward or the Emperor of

Germany or the President of France, acting for their governments, to invite the nations to send representatives to consider the wisdom of forming such a league, the invitation would no doubt be responded to and probably prove successful.

The number that would gladly join such a league would be great, for the smaller nations would welcome the opportunity.

The relations between Britain, France and the United States to-day are so close, their aims so similar, their territories and fields of operation so clearly defined and so different, that these powers might properly unite in inviting other nations to consider the question of such a league as has been sketched. It is a subject well worthy the attention of their rulers, for of all the modes of hastening the end of war this appears the easiest and the best. We have no reason to doubt that arbitration in its present optional form will continue its rapid progress, and that it in itself contains the elements required finally to lead us to peace, for it conquers wherever it is tried; but it is none the less gratifying to know that there is in reserve a drastic mode of enforcement, if needed, which would promptly banish war.

Notwithstanding all the cheering signs of the growth of arbitration, we should delude ourselves if we assumed that war is immediately to cease, for it is scarcely to be hoped that the future has not to witness more than one great holocaust of men to be offered up before the reign of peace blesses the earth. The scoria from the smoldering mass of the fiery past, the seeds that great wars have sown, may be expected to burst out at intervals more and more remote, until the poison of the past is exhausted. That there is to be perfect unbroken peace in our progress to this end we are not so unduly sanguine as to imagine. We are prepared for more than one outbreak of madness and folly in the future as in the past; but that peace is to come at last, and that sooner, much sooner, than the majority of my hearers can probably credit, I for one entertain not one particle of doubt.

We sometimes hear, in defense of war, that it develops the manly virtue of courage. This means only physical courage, which some animals and the lower order of savage men possess in the highest degree. According to this idea, the more man resembles the bulldog the higher he is developed as man. The Zulus, armed with spears, rush upon repeating rifles, not because unduly endowed with true courage, but because they lack common sense. One session or less at St. Andrews University would cure them of their folly. In our scientific day, beyond any that has preceded, discretion is by far the better part of valor. Officers and men, brave to a fault, expose themselves needlessly and die for the country they would have better served by sheltering themselves and living for. Physical courage is far too common to be specially extolled. Japanese, Russian and Turk, Zulu and Achenese

are all famous for it. It is often allied with moral cowardice. Hotspur is an ideal physical-courage hero when he exclaims—

> By heaven, methinks it were an easy leap,
> To pluck bright honor from the pale-faced moon,
> Or dive into the bottom of the deep,
> Where fathom-line could never touch the ground,
> And pluck up drowned honor by the locks;
> So that he that doth redeem her thence might wear
> Without corrival all her dignities.

Vain peacock, unless he could reap the glory and strut bespangled with glittering decorations, he cared not to achieve. All for himself, nothing for the cause, nothing for his country.

Achilles, sulking in his tent, incensed upon the question of loot and praying the gods to defeat his own countrymen, is another example of a physically courageous military hero. Fortunately our modern military men are generally of a different type. It is not the individual who conforms to the standard of his age, but the bad standard of the age that is to be condemned. Men are to be judged only by the standard of their time, and though our standard of to-day may be low indeed, the men conforming to it are not to be decried.

If you would be lifted up and inspired by worshipping at the shrine of the much nobler and rarer virtue, moral courage, stand before the Martyrs' Monument yonder. The martyrs cared nothing for earthly glory and honor or reward; their duty was to stand for a noble cause, and for that, not for their own selfish exaltation, they marched through fire and fagot to death unflinchingly, chanting as they marched.

There is one very encouraging indication of progress within our race, as showing, it is to be hoped, the influence of education upon the masses in evolving clearer ideas of responsibility for their actions. The attention of parliament was recently called to the difficulty of obtaining recruits for the army. The shortage of officers in the auxiliary forces (volunteers and militia) is no less than twenty-five per cent.—one-fourth of the whole. The militia has 32,000 men less than before. The regular army lacks 242 officers, and the British army for India is short 12,000 British recruits. The government pronounces this 'the most serious problem which confronts the military authorities.' Some of the highest military authorities see the final remedy only in conscription. I rejoice to inform you that your kin beyond sea in America have on hand the very same problem for their navy. Their army, being so small, is not yet affected. All their war-ships can not be manned—3,500 men are lacking. From this shortage of recruits we are justified in concluding that there is no longer a general desire in our race to enter the services. This is specially significant, as we are informed that increase of pay would not greatly increase recruiting, as

recruits are obtained chiefly from a certain class. We hear of a like trouble in another profession, a scarcity of young, educated, conscientious men desirous of entering the ministry, thought to be owing to the theological tenets to which they are required to subscribe. Both branches of the church in Scotland have accordingly endeavored to meet this problem by substituting less objectionable terms.

Perhaps from the public library young men have taken Carlyle and read how he describes the artisans of Britain and France: "Thirty stand fronting thirty, each with a gun in his hand. Straightway the word 'fire' is given, and they blow the souls out of one another; and in place of sixty brisk, useful craftsmen, the world has sixty dead carcases, which it must bury and anew shed tears for. Had these men any quarrel? Busy as the devil is, not the smallest! They lived far enough apart, were the entirest strangers; nay in so wide a universe there was even, unconsciously, by commerce, some mutual helpfulness between them. How then? Simpleton! Their governors had fallen out, and, instead of shooting one another, had the cunning to make these poor blockheads shoot."

Those who decline the advances of the decorated recruiting officer may have stumbled upon Professor MacMichael's address to the Peace Congress at Edinburgh, 1853, when he said: "The military profession is inconsistent with Christianity. The higher the rank and the greater the intellect, the more desperate the criminality. Here is a person upon whom God has conferred the rare gift of mathematical genius. If properly directed, what an abundant source of benefit to mankind! It might be employed in the construction of railways, by which the most distant parts of the world are brought into communication with each other. It might be employed in flashing the trembling lightning across the wires, making them the medium of intercourse between loving hearts thousands of miles apart; in increasing the wonderful powers of the steam-engine, relieving man from his exhausting toils; in application to the printing-press, sending light and knowledge to the farthest extremities of the earth. It might be employed in draining marshes, in supplying our towns and cities with water, and in adding to the health and happiness of men. It might lay down rules derived from the starry heavens, by which the mariner is guided through the wild wastes of waters in the darkest night. How noble is science when thus directed, but in the same proportion how debasing does it become when directed to human destruction! It is as if a chemist were to make use of his knowledge not to cure the diseases of which humanity is suffering, but to poison the springs of existence. The scientific soldier cultivates his endowments for what purpose? That he may determine the precise direction at which these batteries may vomit forth their fire so as to destroy most property and most lives; that he may calculate

the precise angles and force with which these shells may be sent up into the air that they may fall upon that particular spot which is thronged with men, and, exploding there, send havoc among them. Great God! am I at liberty to devote my faculties to the infernal work?"

That is a voice from Dunfermline of weighty import. I found it recently and rejoiced that, when a child, I had often seen the man who wrote these words.

Wyclif's opinion may have arrested the young men's attention: "What honor falls to a knight that kills many men? The hangman killeth many more and with a better title. Better were it for men to be butchers of beasts than butchers of their brethren!"

Or John Wesley's wail may have struck deep in the hearts of some fit for recruits: "You may pour out your soul and bemoan the loss of true, genuine love in the earth. Lost indeed! These *Christian* kingdoms that are tearing out each other's bowels, desolating one another with fire and sword! These Christian armies that are sending each other by thousands, by tens of thousands, quick to hell!"

It may be from eminent soldiers that young men have received the most discouraging accounts of the profession. Napoleon declared it 'the trade of barbarians.' Wellington writes Lord Shaftesbury, "War is a most detestable thing. If you had seen but one day of war, you would pray God you might never see another." General Grant, offered a military review by the Duke of Cambridge, declined, saying he never wished to look upon a regiment of soldiers again. General Sherman writes he was "tired and sick of the war. Its glory is all moonshine. It is only those who have neither fired a shot nor heard the shrieks and groans of the wounded, who cry aloud for more blood, more vengeance, more desolation. War is Hell."

Perhaps some have pondered over Sir John Sinclair's opinion that 'the profession of a soldier is a damnable profession.'

The professional soldier is primarily required for purposes of aggression, it being clear that if there were none to attack, none to defend would be needed. The volunteer, who arms only to be better able to defend his home and country, occupies a very different position from the recruit who enlists unconditionally as a profession and binds himself to go forth and slay his fellows as directed. The defense of home and country may possibly become necessary, although no man living in Britain or America has ever seen invasion or is at all likely to see it. Still, the elements of patriotism and duty enter here. That it is every man's duty to defend home and country goes without saying. *We should never forget, however, that which makes it a holy duty to defend one's home and country also makes it a holy duty not to invade the country and home of others,* a truth which has not hitherto been

kept in mind. The more's the pity, for in our time it is one incumbent upon the thoughtful peace-loving man to remember. The professional career is an affair of hire and salary. No duty calls any man to adopt the naval or military profession and engage to go forth to kill other men when and where ordered, without reference to the right or wrong of the quarrel. It is a serious engagement involving as we lookers-on see it, a complete surrender of the power most precious to man—the right of private judgment and appeal to conscience. Jay, the father of the first treaty between Britain and America, has not failed to point out that "our country, right or wrong, is rebellion against God and treason to the cause of civil and religious liberty, of justice and humanity."

Just in proportion as man becomes truly intelligent, we must expect him to realize more and more that he himself alone is responsible for his selection of an occupation, and that neither pope, priest nor king can relieve him from this responsibility.

It was all very well for the untaught, illiterate hind, pressed into King Henry's service, to argue, "Now, if these men do not die well, it will be a black matter for the King that led them to it, whom to disobey were against all proportion of subjection." The schoolmaster has been abroad since then. The divine right of kings has gone. The mass of English-speaking men now make and unmake their kings, scout infallibility of power of pope or priest, and in extreme cases sometimes venture to argue a point even with their own minister. The 'Judge within' begins to rule. Whether a young man decides to devote his powers to making of himself an efficient instrument for injuring or destroying, or for saving and serving his fellows, rests with himself to decide after serious consideration.

To meet the scarcity of officers, the government stated that it was considering the policy of looking to the universities for the needed supply, and that steps might be taken to encourage the study of war with a view to enlistment; but if university students are so far advanced ethically as to decline pledging themselves to preach 'creeds outworn'—rightfully most careful to heed the 'Judge within,' their own conscience—universities will probably be found poor recruiting ground for men required to pledge themselves to go forth and slay their fellow men at another's bidding. The day of humiliation will have come upon universities when their graduates, upon whom have been spent years of careful education in all that is highest and best, find themselves at the end good for nothing better than 'food for powder.' I think I hear the response of the son of St. Andrews to the recruiting officer, 'Is thy servant a dog that he should do this thing?'

From one point of view, the scarcity of officers and recruits in Britain and America, where men are free to choose, and the refusal of

university students to compromise themselves by pledges upon entering the ministry, are most cheering, evincing as they do a keener sense of personal responsibility, a stronger appeal to conscience—the 'Judge within'—more tender and sympathetic natures, a higher standard of human action and altogether a higher type of man.

If war requires a surrender of all these by its recruits, much better we should face the alternative and let Britain and America depend upon the patriotism of citizens to defend their countries if attacked, in which duty I for one strongly believe they will never be found inefficient. Colonel Henderson, in his 'Science of War,' states "that the American Volunteers were superior to the conscript levies of Europe—that the morale of conscript armies has always been their weakest point. The morale of the volunteer is of a higher type." This stands to reason.

Should Britain ever be invaded, the whole male population able to march would volunteer, and from many parts of the world thousands would rush to the defense of the old home. Those who invade the land of Shakespeare and Burns will find they have to face forces they never reckoned upon. The hearts and consciences of all would be in the work; and 'Thrice is he armed who hath his quarrel just.'

Students of St. Andrews, my effort has been to give you a correct idea of the movement now stirring the world for the abolition of war, and what it has already accomplished. It never was so widespread or so vigorous, nor at any stage of the campaign have its triumphs been so numerous and important as those of the last few years, beginning with the Hague conference, which in itself marks an epoch. The foundation stone of the structure to come was then laid. The absolute surrender by four nations of all future differences to arbitration, and Norway and Sweden's agreement, mark another stage. Thus the civilized world at last moves steadily to the reign of peace through arbitration.

The question has no doubt arisen in your minds, what is your duty and how can you best cooperate in this holy work and hasten the end of war. I advise you to adopt Washington's words as your own, 'My first wish is to see this plague of mankind, war, banished from the earth.' Leagues of peace might be formed over the world with these words as their motto and basis of action. How are we to realize this pious wish of Washington's? may be asked. Here is the answer. Whenever an international dispute arises, no matter what party is in power, demand at once that your government offer to refer it to arbitration, and if necessary break with your party. Peace is above party. Should the adversary have forestalled your government in offering arbitration, which for the sake of our race I trust will never occur, then insist upon its acceptance and listen to nothing until it is accepted.

Drop all other public questions, concentrate your efforts upon the one question which carries in its bosom the issue of peace or of war. Lay aside your politics until this war issue is settled. This is the time to be effective. And what should the ministers of the churches be doing? Very different from what they have done in the past. They should cease to take shelter from the storm, hiding themselves in the recital of the usual formulas pertaining to a future life in which men in this life have no duties, when the nation is stirred upon one supreme moral issue, and its government, asserting the right to sit in judgment upon its own cause, is on the brink of committing the nation to unholy war—for unholy it must be if peaceful settlement offered by an adversary be refused. Refusal to arbitrate makes war, even for a good cause, unholy; an offer to arbitrate lends dignity and importance to a poor one. Should all efforts fail, and your country, rejecting the appeal to judicial arbitration, plunge into war, your duty does not end. Calmly resolute in adherence to your convictions, stating them when called upon, though never violently intruding them, you await the result, which can not fail to prove that those who stood for peaceful arbitration chose the right path and have been wise counsellors of their country. It is a melancholy fact that nations looking back have usually to confess that their wars have been blunders, which means they have been crimes.

And the women of the land, and the women students of St. Andrews—what shall they do? Not wait as usual until war has begun, and then, their sympathies aroused, organize innumerable societies for making and sending necessaries and even luxuries to the front, or join Red Cross societies and go themselves to the field, nursing the wounded that these may the sooner be able to return to the ranks to wound others or be again wounded, or to kill or be killed. The tender chords of sympathy for the injured, which grace women, and are so easily stirred, are always to be cherished; but it may be suggested that were their united voices raised in stern opposition to war before it was declared, urging the offer of arbitration, or in earnest remonstrance against refusing it, one day of effort would then prove more effective than months of it after war has begun.

It is certain that if the good people of all parties and creeds, sinking for the time other political questions whenever the issue of war arises, were to demand arbitration, no government dare refuse. They have it in their power in every emergency to save their country from war and ensure unbroken peace.

If in every constituency there were organized an arbitration league, consisting of members who agree that arbitration of international disputes must be offered, or accepted by the government if offered by the adversary, pledging themselves to vote in support of, or in opposition to,

political parties according to their action upon this question, it would be surprising how soon both parties would accept arbitration as a policy. I know of no work that would prove more fruitful for your country and for the world than this. It is by concentrating upon one issue that great causes are won.

In this holy work of insisting upon arbitration, surely we may expect the men and women of St. Andrews, of all universities and other educational institutions, of all the churches and of all the professions to unite and take a prominent part. I quoted the words of Washington at the beginning of this appeal. Let me close by quoting the words of Lincoln. When a young man, employed upon a trading boat, he made a voyage of some weeks' duration upon the Mississippi. He visited a slave market, where men, women and children were not slaughtered, as formerly in war, but were separated and sold from the auction block. His companion tells that after standing for some time Lincoln turned and walked silently away. Lifting his clenched hand, his first words were, 'If ever I get a chance, I shall hit this accursed thing hard.' Many years passed, during which he never failed to stand forth as the bitter foe of slavery and the champion of the slave. This was for him the paramount issue. He was true to his resolve throughout life, and in the course of events his time came at last. This poor, young, toiling boatman became president of the United States, and was privileged with a stroke of his pen to emancipate the slaves last remaining in the civilized world, four millions in number. He kept the faith, and gave the lesson for all of us in our day, who have still with us war in all its enormity, many of us more or less responsible for it, because we have not hitherto placed it above all other evils and concentrated our efforts sufficiently upon its extinction. Let us resolve like Lincoln, and select man-slaying as our foe, as he did man-selling. Let us, as he did, subordinate all other public questions to the one over-shadowing question, and, as he did, stand forth upon all suitable occasions to champion the cause. Let us, like him, keep the faith, and as his time came, so to us our time will come, and, as it does, let us hit accursed war hard until we drive it from the civilized world, as he did slavery.

THE BODY'S UTILIZATION OF FAT

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RECENT physiology has considerably advanced our knowledge of fatty metabolism. Some of the recent work has had an important bearing on metabolism in general, as well as on the special metabolism of fats. This article aims to outline the results of some of the more important experimental work on the subject.

Fat is the form in which the body lays up its greatest supply of potential energy. Plants also store energy, but they do it chiefly in the form of sugar and starch or, to give these substances a single name, *carbohydrate*. As the animal kingdom is parasitic directly or indirectly upon the vegetable, it results that the animal's food is largely composed of carbohydrate. Thus Voit's figures, expressing the needs of an adult man, are 118 grams of proteid,[1] 50 grams of fat and 500 grams of carbohydrate food in twenty-four hours.

But there are good reasons why carbohydrate, which is our most abundant and cheapest food, would not be an economical store of energy for the animal body. Chief among these is the fact that animals are for the most part motile and hence the advantage of having their store of energy-producing compounds in small compass and of light weight. Fat fulfils the indications admirably, since its atoms, carbon and hydrogen, are light, since a given weight is capable of combining with a large amount of oxygen and since it can be completely oxidized in the body, *i. e.*, the body is able to utilize all its potential energy.

Not all our fat comes from the fat of our food, but is made in the body from other substances. There are two theories—one that it is made from carbohydrate, the other that it is made from proteid.

An animal can be fattened without giving it any fat in its food, in fact, the usual method of fattening animals is by increasing their carbohydrate food. Though there is some question of the origin of fat from proteid, there can be little or none as to the transformation of carbohydrate into fat. This knowledge that fat can be so made upsets one of the notions largely held till recently as to the kind of chemistry

[1] Chittenden has investigated our proteid needs very carefully and would probably agree that these figures fairly well represent what the average man does consume, but he finds that such a quantity of proteid is much beyond actual needs. He found men able to do work of all kinds, both mental and physical, and retain good health on one third to one half this quantity of proteid.

of which the animal as distinguished from the vegetable body is capable. It was thought that animal chemistry was all of a sort which would produce more fixed and stable compounds and convert compounds of greater potential energy into those of little or none. On the other hand, the synthesis of organic compounds was believed to be confined to the vegetable kingdom. This distinction in the character of the chemical processes in the two forms of living things was believed to be one of their fundamental differences. It is still true that the end products of animal metabolism are simple oxidized substances and that plants are largely engaged in synthetic chemistry, but the difference in this regard is one of degree only. The number of known synthetic processes occurring in the animal body is constantly increasing, and the formation of the complex fat molecule from the comparatively simple and partly-oxidized sugar molecule is an instance of a complex synthesis. To build up this fat molecule a number of sugar molecules must be disintegrated and a portion of each must be taken to be combined with others into the large molecule of neutral fat. Another, but more simple, synthesis, to be referred to later, is the synthesis of the neutral fat molecule from the fatty acid absorbed from the small intestine. In this process three molecules of fatty acid are used to make one molecule of neutral fat.

Our text-books only a few years old tell how fats are absorbed from the intestine by a process entirely different from that by which the sugars and proteids are absorbed.

The latter substances by an hydrolysis and cleavage are made soluble and diffusible and in this dissolved form are absorbed. We were told a different story of the fats—that while a portion of the fat was really digested, *i. e.*, converted into a fatty acid and glycerine and thus absorbed—that the greater part was simply emulsified and that the finely divided particles of fat were then 'swallowed whole' by the intestinal epithelium in some such way, to look for an illustration, as the amoeba takes its food. The evidence for this seemed fairly convincing; in the first place, the fat could be seen in the emulsified state in the intestine in contact with the epithelial cells lining it. And in the substance of these epithelial cells, as though just devoured from the intestinal contents, were seen similar droplets of fat. This view, however, has given place to the view that all the absorbed fat is first converted into fatty acid and absorbed in this form or perhaps partly also as a soap, then reconverted into neutral fat. The older theory was abandoned for the following reasons: No one saw the fat droplets passing into the cell; none were seen in the border of the cell in contact with the intestinal contents, but only at the base of the cell farthest removed from the source of supply of fat. The same appearances in the epithelial cells were noted if a dog was fed with no fat, but with fatty acid instead, suggesting in this case certainly that the fat globules

in the epithelial cells were made from absorbed fatty acid. Further, the observation has been made that the fat particles in the epithelial cells are small at the beginning of intestinal digestion, but that they grow larger when the digestion has been in progress some time, as though the droplets were made at the point where they are seen. Again it has been shown that the fat ferment in the small intestine is abundantly able to convert the fat of an ordinary meal completely into fatty acid in the time usually required for a meal's digestion.

However, it seemed difficult to understand how a drop of fat in contact with an epithelial cell was first converted into fatty acid, then absorbed by the cell and, before leaving the confines of the absorbing cell, reconverted into a droplet of fat. But a similar transformation is believed to occur in the case of proteid absorption. Proteids in digestion are converted into peptone and thus absorbed, but no peptone is found in the body, not even in the intestinal blood vessels, hence the peptones must be at once reconverted into other proteids in the act of absorption.

The work of Kastle and Loewenhart makes it clear, in the case of fat, how the reverse processes are brought about. Before referring to their work let us remark that it is well known that the action of ferments is never complete unless the product of the fermentation is removed. To illustrate—if grape juice is fermenting to become wine, the conversion of sugar to alcohol at first may be quite rapid, but by the time a wine of ten per cent. alcohol is formed the alcohol present inhibits the further action of the ferment. If the alcohol could be removed from the wine, the action of the ferment would continue so long as there was sugar present to ferment.

Further, it has been shown that the action of a ferment may be reversible, *i. e.*, that the same ferment which will convert a solution of carbohydrate *A* into carbohydrate *B* will also convert a solution of carbohydrate *B* into a carbohydrate *A*. But, as just mentioned, the action of no ferment is complete, hence whether we start with a solution of *A* or of *B*, the ferment action brings about a solution of *A* and *B* in such proportion that ferment action ceases, *i. e.*, the condition has become one of chemical equilibrium. Kastle and Loewenhart worked with the ferment lipase, whose known action was the conversion of neutral fats into fatty acid and glycerine. They added the ferment to a solution of fatty acid and were able to demonstrate the formation therefrom of the neutral fat.[2] The importance of this observation is very great. First, it adds another to the list of animal synthetic processes. Second, it offers an easily comprehended explanation of the absorption of fat. For in case the small intestine contains neutral fat immediately after a meal, the ferment will soon begin to convert

[2] They employed butyric acid and synthetized ethyl butyrate.

it into fatty acid and glycerine. This action, according to ferment law, would continue till a mixture of fat and fatty acid in chemical equilibrium was produced. But in the intestine, absorption begins and fatty acid is removed as fast as formed, thus allowing the ferment to continue its action as long as any fat remains in the intestine. But if both fatty acid and ferment are absorbed together, then, as soon as they get inside the absorbing cell, the ferment in the presence of fatty acid only will begin its work over again, which then will be the formation of droplets of neutral fat from the fatty acid absorbed.

This view rests on the assumption that fat ferment accompanies the fat from intestine to tissue. The observers mentioned have investigated this subject. They examined a large number of fat-containing tissues and organs, and found in every case that they contained fat ferment about in the proportion that they contained fat, except that the liver contained a very active ferment out of proportion to the amount of fat in that organ.

The fat absorbed from the intestine finds its way into the lymphatics and thence to the thoracic duct, there to be mingled with the blood. Shortly after a meal if the blood serum of an animal be taken and allowed to stand a layer of fat forms on top. The serum taken some hours after a meal, on standing forms no such layer, showing that fat rapidly disappears from the blood. And here arises one of the interesting problems of fat metabolism. What becomes of fat when it disappears from the blood and what is the origin of the fat in the tissues? A very simple explanation would be that the fat of the blood is deposited in the tissue cells. Another theory, and one that has had the sanction of good authority, is that the fat in the tissues is made there from their own proteid substance.

In favor of the transformation of proteid into fat are usually mentioned the following: In the ripening of cheese, fat is increased at the expense of proteid. In certain damp soils corpses have their proteid converted into a fatty substance known as adipocere. Both of these arguments are somewhat less convincing when it is known that bacteria are the active agents of these changes. As the result of various poisons —notably phosphorus—the liver is found to contain large quantities of fat in the form of droplets in the injured cells of the organ. This has been called fatty degeneration and the protoplasm of the degenerating cells in one stage of degeneration was thought to be changed to fat. On the other hand, it is claimed that if an animal is first starved, so that fat disappears from the body, and then poisoned with phosphorous, no fat appears in the liver. There is too other evidence of an experimental nature to show that the fat of fatty degeneration is fat transported from the usual depots of fat and simply

deposited in the degenerating cells.[3] The fat of different animals consists of different proportions of the three common fats, olein, palmitin and stearin. But for each animal the proportion in which the three fats enter into its fatty mixture is fairly constant. Recall the difference between beef and mutton tallow and lard. This proportion of fats being fairly constant for an animal species, it does not change with every change of diet. But if an animal be starved for a time and then fed exclusively on a particular fat, such as some vegetable fat never normally found in the animal, the fat used can be demonstrated as present unaltered in the tissues. The question then of the origin of tissue fat is still somewhat uncertain. It seems safe to say that the fat of the food can be deposited unaltered in the tissues, but that all the fat found in the tissues has had its origin in fatty food is certainly not the case; much of it is made from carbohydrate and some of it may be made from proteid.

Turning to the question of the disposal of fat in the body, we may say that it is completely burned in the tissues and has as its end products carbonic acid and water.

A moderate amount of fat in many tissues, especially the subcutaneous connective tissues, the omentum and tissue about the kidney, is normal, and serves as a store of energy, as a protective covering to the body and to retain the body's heat. But there are many persons in whom this amount is excessive, that is, in no way proportioned to their needs. In seeking an explanation of these cases we are at once struck with individual differences. For instance, one sees persons over whose bodies there is a uniform thick layer of fat; they are of florid complexion and many of them active persons. The term corpulent applies to them better than obese, since their bodies exhibit both an increase of fat and of protoplasm and their blood is of normal specific gravity. In the presence of a good digestion and abnormal appetite, they daily consume more food energy than the daily expense of energy requires. The excess is laid away as tissue proteid and fat. A moderate diminution in food taken with some increase in exercise would rectify the condition. But it is almost a waste of words to tell a man to eat less in the presence of an excellent appetite and digestion.

There are other persons in whom the picture is quite different. The fat is not uniformly distributed, but is largely abdominal, the arms and legs being little enlarged; they are pale, and blood examination reveals anemia and diminished specific gravity of blood. Herter calls attention to the rather striking parallel between this condition and diabetes. In diabetes there is an excess of sugar in the body tissues. This has been shown not to be due to any increase in sugar manufacture, but to

[3] The question of the origin of fat from proteids is ably discussed by Henry A. Christian, M.D., 'Some Newer Aspects of the Pathology of Fat and Fatty Degeneration,' *Bull. of Johns Hopkins Hosp.*, January, 1905.

an inability of the body to oxidize the sugar. In diabetes the excess of sugar then is removed by the kidneys. In obesity the fat is not removed, but accumulates in adipose tissue. The explanation of both conditions would be an inability of the body cells to oxidize these substances. Herter states the points of similarity of the conditions thus:

1. Diminished oxidation of both materials.

2. The two conditions are frequently associated.

3. In each case the defective utilization of nutritive materials is more or less closely associated with substances produced by certain glands. It has been clearly proved that disease of, or removal of, certain groups of cells imbedded in the pancreas, known as the 'islands of Langerhans,' cause the appearance of sugar in the urine. And no doubt remains that many of the cases of diabetes are primarily disease of the pancreas. On the other hand, obesity may depend on the suspension of function of other glands. The removal of the sexual glands is commonly, though by no means invariably, followed by the laying on of fat. This fact is taken advantage of by the poultryman in supplying capon for the market. Members of the human species may be similarly affected.

But the gland showing the most intimate relation between its function and obesity is the thyroid. This gland is situated in the neck, on either side of the trachea. Its enlargement constitutes goitre. Its absence or disease result in cretinism and myxœdema. When portions of the dried gland of a sheep are mixed with the food of the normal or obese individual marked bodily changes result. The results of thyroid feeding in men and animals have been well summarized by Richardson.[4] In the first place, there is a marked increase of oxygen consumption and carbonic acid excretion, that is, some constituent of the gland promotes oxidation. This is accompanied by a loss of weight.

The oxidation is not, however, selective of the fats alone, for most observations have shown that there is an increase in the elimination of nitrogen. This would mean that proteid is being consumed as well as fat. If an animal was in nitrogenous equilibrium at the beginning of the experiment, we should expect it to be considerably weakened by its consumption of its own protoplasm. If, however, the nitrogenous food is increased, while thyroid substance is being fed to the animal the condition of nitrogenous equilibrium can again be restored, and the subsequent loss of weight will be due chiefly to the oxidation of fat. The above statement makes it clear that the question of the amount of fat in any individual is a very complex one, depending on such a variety of factors as condition of digestion, appetite, character and quantity of food, amount of exercise and the proper working of a number of body glands.

[4] 'The Thyroid and Parathyroid Glands,' Hubart Richardson, 1905.

NATIONAL CONTROL OF INTRODUCED INSECT PESTS

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THE boll weevil in Texas and the gypsy and brown-tail moths in New England are raising some points in the relations between the states and the federal government in insect control which seem to involve new principles, whose discussion may not be untimely.

Here we have insects which the infested states fail to control, either through inability or neglect, and they spread beyond their boundaries. Quarantines against them are comparatively useless, unless the insects are controlled in the badly infested regions. But why should one state tax itself to subdue a pest which is causing it loss and others gain from increased prices, as in the case with the cotton boll weevil, to prevent it from spreading to them? On the other hand, if it is possible for the state to do so, is the national government justified in assuming the task if it had the authority? Congress makes appropriations to aid in the study of insect pests for the information of the inhabitants of uninfested states, but can it legislate so that a federal official may have authority to proceed in preventing the introduction, or exterminating or controlling any pest which threatens to invade other states and to seriously threaten their welfare? These are new entomological questions of a broad nature which circumstances have forced upon us and which must be solved in the near future.

The writer's first impression, which seems to be the prevailing one, was that the federal government has no authority to make any regulations toward exterminating or controlling an insect pest within a state, except under the laws of that state. Further study of the subject, in relation to the federal control of similar matters of public health and welfare, has forced the conclusion that this view is essentially incorrect and that the national government may have full authority conferred upon it by congress under the constitution for handling the whole situation.

A few points concerning the history of legislation against insect pests in this country may be mentioned to show its present status. Legislation against insect pests in the east was undoubtedly brought about by the introduction and dissemination of the San Jose scale on nursery stock in the early nineties. State after state passed laws concerning nursery inspection and the importation of nursery stock and some concerning inspection of orchards, etc. Some were good; others

bad. Confusion for the nurseryman resulted. In late years we have been engaged in attempting to secure as much possible uniformity in these laws, in which the organization of the National Association of Horticultural Inspectors has been of the greatest value. From the first it was seen that the matter of the control of nursery stock was properly a matter for control by the national government, being strictly a matter of interstate commerce. As a result, on March 5, 1897, there assembled in Washington, D. C., a National Convention for the Suppression of Insect Pests and Plant Diseases by Legislation. This convention represented the horticultural and agricultural interests of the entire country. It recommended a measure to Congress empowering the Secretary of Agriculture to establish an inspection of all importations of nursery stock, plants, etc., into the United States, and of all which were subject to interstate commerce, and also drafted a suggestive outline for state legislation upon the same subject. This proposed legislation seems to cover the matter of the inspection and control of insects disseminated on nursery stock, plants, etc., in a most satisfactory manner, though some minor points might now need modification. At this convention Dr. L. O. Howard, entomologist, U. S. Department of Agriculture, presented a paper, in closing which he is reported to have said, that it was "his firm conviction that the establishment of such a service at the eastern ports . . . would many times repay the horticultural interests of the country." In the next 'Yearbook' of the Department of Agriculture for 1898, in a most interesting and valuable article upon the 'Danger of Importing Insect Pests,' Dr. Howard again urged the importance of such legislation. He said:

> The remedy for this condition of affairs is obvious. Laws must be passed establishing a system of inspection of dangerous classes of merchandise, just as has already been done in the case of live stock, and just as has already been done in a partial way by the state of California. The passage of some such national measure as that recommended by the convention of horticulturists and agriculturists held in Washington, D. C., March 5, would seem, from a consideration of the facts here presented, to be abundantly justified by the constant danger which threatens our agricultural and horticultural interests.

The writer is not familiar with the inside history of the work of the committee on legislation appointed by this convention. In any event nothing came of it. The impression is general that the matter at first received the opposition of influential nurserymen. Later, however, when it became necessary for the nurserymen to comply with many and diverse laws to their great inconvenience and annoyance, they evinced interest in securing national legislation on the matter. The chairman of their committee on legislation recently expressed his earnest desire that national legislation might be enacted upon the subject, but after practical experience in presenting the matter to congressional committees seemed to feel that there was but little prospect of

securing such attention in the near future. There seems to have been no serious discussion of the matter by any entomologist since Dr. Howard's article in 1898.

In many states the nursery and orchard inspection is now handled by separate state officials, relieving the entomologists of the experiment stations and state entomologists of this onerous police work. But in many states it is still a burden to the entomologist, who would prefer to devote his time and thought to problems of research. That this work has impeded the development of economic entomology in many respects can not be doubted, though, on the other hand, it has undoubtedly had the effect of bringing many entomologists into closer touch with the people whom they are trying to serve. It would seem, therefore, that the entomologists of the country should be most interested in securing national legislation for this phase of insect control at least. That it is perfectly constitutional and practicable can hardly be doubted. The present work could be accomplished with much more efficiency, with greater protection to the horticultural interests and with far less annoyance to the honest nurserymen of the country, and probably to the greater detriment of the nurseryman who fails to clean his premises of dangerous insect pests and plant diseases.

But at this same national convention of 1897 a resolution was passed concerning congressional appropriation to aid Massachusetts in its fight against the gypsy moth as follows:

> *Resolved*, That this is a question of national importance, and that the national government should assume the work of extermination or render substantial financial assistance to the state of Massachusetts for that purpose, that the work may be carried to a successful conclusion and this continent be thus saved from the ravages of another terrible insect pest.

In passing this resolution, the convention recognized the responsibility of the federal government in protecting the uninfested states from the spread of the gypsy moth, which by precedent would involve the same aid for all other insect pests of sufficient importance. It is in this phase of the question that New Hampshire is now particularly interested. By means of an appropriation from the state legislature which would not be burdensome, and which will no doubt be made at the next session, we can probably prevent the spread and increase of the gypsy moth in New Hampshire by annual inspections along all highways liable to be infested. But without the expenditure of a very much larger sum, and in a more efficient manner than is now possible under the present law, by the state of Massachusetts, it may be but a few years before the gypsy moth will be so abundant in Massachusetts up to the New Hampshire line that it will be practically impossible to prevent its spread or to control it in New Hampshire. New Hampshire is thus ultimately helpless to prevent the invasion of the gypsy moth and the possible destruction of her grand old elms shading the highways, or to

protect her important lumber interests and forest-clad mountains, the features which make the state one of the most beautiful and attractive in the union, unless Massachusetts may be aided by liberal appropriations from the federal government, so that the further spread of the pest may be checked and be increasingly controlled where it is worst. To this end bills have been introduced during the present session by Hon. E. W. Roberts, of Massachusetts (H. R. 285 and 286), appropriating $250,000 for the extermination or control of the gypsy moth and $15,000 for the importation of parasites and predaceous enemies, to be administered by the secretary of agriculture. This measure has the support of New Hampshire and all the best interests of New England.

But though this appropriation is necessary for immediate use, it seems that the whole matter of the relation of the national government to the control of insect pests is in an unsatisfactory condition. Who can guarantee that this appropriation will be repeated? How can it be administered under present laws, except through the officials of the state of Massachusetts? In New Hampshire there is no legislation upon the matter at present, and any action would have to be done entirely with the permission of property owners, and by the approval of the governor, as at present no damage to property would be involved. If the national government has the power to make an appropriation for this purpose why has it not the right and duty to provide the proper machinery for its administration whenever the necessity may arise from other pests in various parts of the country, without special subsequent action of congress authorizing the same, and if congress has such prerogatives, why should they not be exercised for the benefit of the agricultural and horticultural interests, as well as those of the city trees of the entire country? To show the propriety, feasibility, and desirability of such legislation is the writer's purpose.

That national control of introduced insect pests would be of the greatest value can hardly be doubted after a brief glance at the history of the worst introduced insects of the last twenty-five years. Had there been a federal official with authority to proceed and stamp out and control the San Jose scale when it first appeared in the east, could not its spread have been to a very large extent prevented, if not indeed entirely stopped? Or similarly, if a federal official had commenced the extermination or control of the gypsy moth in the eighties before it was taken up by Massachusetts, and had supervised the work of that state, being ready to step in and prevent its subsequent spread sufficient to endanger the neighboring states, would not the alarming conditions now existing have been to a large extent prevented? The same is true of the brown-tail moth. The Gypsy Moth Committee of Massachusetts fully appreciated the danger of this pest, which in many respects is worse than the gypsy moth, but they had no funds with which to combat it. Later a small appropriation was made, but it was entirely in-

adequate and too late to control the pest. Had the money been available when the brown-tail moth was first discovered, and had it been efficiently administered, we have no doubt that it might have been effectively controlled. How much loss it will now cause in years to come is entirely problematical, unless the European parasites become of immediate value, for there is nothing to prevent its spread over the entire east within a few years. Last year it spread over one hundred miles in New Hampshire. Again, when the boll weevil was discovered in south Texas, a representative of the United States Department of Agriculture appeared before the legislature of Texas and advised legislation which would prevent the growing of cotton in the infested counties, which grew but a small amount, for a few years, so that the pest might be exterminated, but he was literally laughed down. Had the federal government been able to step in at that time and enforce whatever measures seemed best to prevent the subsequent spread of this insect throughout the cotton belt, the subsequent loss of at least $22,000,000 to Texas alone in 1904 and the present certainly unpropitious outlook for the cotton interests of Louisiana and the Mississippi Valley might have been averted. Might not the introduction or subsequent spread of the miserable little New Orleans ant (*Iridomyrmex humidis* Mayr.), which is now becoming such a nuisance in New Orleans and in southern Louisiana, and whose spread through the south it seems impossible now to prevent or restrict, have been prevented and controlled, had we had such national legislation and organization?

Other instances might be cited, but these are well known to all. Who can tell what pest may not invade some one of our boundary states at any time and increase to such numbers that it will be impossible to prevent its spread before state legislation copes with it? It is to be regretted, but we may as well frankly admit that the present tendency toward federal control of all of these police duties is almost entirely due to the inefficiency of most of our state legislatures in dealing with such matters. Until very recently the states have been very reluctant to delegate any power to make and enforce regulations to any board or official. In doing this the Gulf states in general have the most desirable type of entomological legislation, permitting effectual work against any insect pests which may arise. In most of the states which have legislation upon insect pests, the official administering it is hampered by petty restrictions, and has no funds at his disposal for coping with any new pest which may require immediate action. The average state legislature is very wary of entrusting such powers to any scientist, assuming in many cases that it knows much more about the subject. The debates of the Texas legislature upon the boll weevil and the information given the writer by some of its members would prove amusing reading to the entomological fraternity. Congress, on the other hand, has consistently recognized that it must depend upon ex-

perts in such work and must give them sufficient latitude, so that they can take immediate action when necessity arises. To this has been largely due the efficiency of the federal law in very many matters in which the state laws have been conspicuously inefficient.

How many of our seaboard or frontier states have at the present time any system of inspection which will enable them to prevent the importation of injurious insect pests, or how many, even, could proceed to eradicate such pest when actually within the borders of their state when over a few hundred dollars were necessary for its eradication? California is probably the only state having any adequate machinery for such work.

But it is objected that the work of exterminating an insect within a state would be unconstitutional, an interference with the rights of the state, etc. So it would seem and so at first it appeared to the writer, but the present laws of congress concerning the control of cattle and human diseases and the regulation of the importation of noxious animals effectually dispel this objection.

At the present time the Public Health and Marine Hospital Service has charge of most of the maritime quarantine stations and may take charge of any others it sees fit when they are inefficient under state or municipal management. It furthermore may enforce interstate quarantines, or may quarantine any portion of a state and take such measures as it sees fit to eradicate disease in any locality when the local or state health officials, either through lack of legislation or inefficiency, fail to control disease so that it threatens neighboring states. This has actually taken place in several instances. For a full discussion of federal quarantine measures see an article by James Wilford Garner, of the University of Illinois, in the *Yale Review* for August, 1905, pp. 181–205. At the present time the southern states are petitioning congress for the national government to take entire control of maritime and interstate quarantines, owing to the proved efficiency of the government service in handling the yellow fever outbreak during the past season. Surely there can be no better proof of the desirability of federal control of quarantines than the present attitude of the southern states, for no section of the country has had their experience with quarantines and no section has been more opposed to federal quarantines in the past.[1].

By the Lacey act[2] congress has conferred upon the secretary of agriculture the power to make and enforce regulations to prevent the importation of noxious animals, and this act has now been enforced for five years. In essence the law proposed by the convention of 1897

[1] See the *Congressional Record* of March, 1893, for the lengthy debates in the house and senate upon the present national quarantine law, which was admittedly a compromise measure.

[2] See Circular 29, Biological Survey, U. S. Dept. Agr.

would cover the same ground for the prevention of the importation of insect pests.

But more stringent, sweeping and effectual than either of these laws are those establishing and defining the duties and powers of the Bureau of Animal Industry of the Department of Agriculture.[3]

These laws and regulations empower the Bureau of Animal Industry to inspect all import and export domestic animals and all subject to interstate commerce for dangerous diseases. They empower it to proceed to stamp out such diseases as are deemed dangerous and to purchase diseased animals at a fair appraisal when necessary to stamp out a disease. In this work the bureau may and has repeatedly quarantined different states and sections of states. At the present time, the regulations of the bureau prohibit the movement of cattle from counties south of the Texas Fever Line to other counties within the same state, whether the cattle are for interstate commerce or not. These laws and regulations have been tested in the courts and so far have been held constitutional.

Furthermore, congress appropriates for the Bureau of Animal Industry a sum which is specifically for the control of outbreaks of disease. By this means the bureau was able to proceed at once against the foot and mouth disease in New England in 1902. A deficiency appropriation was at once authorized by the next congress (for $500,000, approved December 22, 1902), which enabled the work to proceed without delay. A similar amount was included in the regular appropriation for the bureau for the fiscal year ending June 30, 1904, but the work had been so thoroughly done under the previous appropriation for such work prior to that time that but little of the last appropriation of $500,000 was used. It was a portion of this unused balance, $250,000, which was subsequently appropriated for the investigation of the boll weevil and cotton culture.

Not only do the regulations prohibit the movement of diseased cattle or any cattle from a quarantined state or section, either by shipment or by driving, but they prohibit allowing cattle to drift from one section to another. Furthermore, any hay, straw or other material which may harbor disease from a quarantined area may be entirely regulated by the bureau.

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[3] See Regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock, which is the subject of interstate commerce, 1905. Issued under authority conferred on the Secretary of Agriculture by the acts of Congress approved May 29, 1884, February 2, 1903, and March 3, 1905 —which acts are printed in it. Also, see Administrative Work of the Federal Government in Relation to the Animal Industry, by G. F. Thompson, 16th Annual Report, Bureau of Animal Industry, 1899, pp. 102–125, and Federal Inspections of Foreign and Interstate Shipments of Live Stock, by D. E. Salmon, D.V.M., 18th Ann. Rept., Bur. Anim. Ind., 1901, pp. 237–249.

If, therefore, congress, through these agencies, is preventing the introduction of human and animal diseases and noxious animals, and their interstate movement, and eradicates or controls them in sections where their presence threatens the commerce and welfare of other states, why may not the spread of imported insect pests dangerous to plants be similarly regulated? The writer has studied the principles involved with some care and fails to see that those concerning insect pests of domestic animals and plants are not identical.

An interesting phase of the whole discussion arises from the recent convention of the southern states, which passed resolutions, not only praying congress that the national government take charge of all quarantines, but that it proceed to the extermination of the yellow-fever mosquito. Whether extermination of this pest is possible or not I am not informed. From experience with other insects it would seem doubtful. There can be no question, however, that to control yellow fever the breeding of *Stegomyia fasciata* must be prevented. In the control of yellow fever, the federal government would therefore have a perfect right to proceed against this insect as a menace to human health. We have then the anomalous condition that the national government can control the introduction and spread of insects which affect the health of man and the domestic animals, but that it has no laws against those affecting crops or plant life. Is not the loss to plant life from insect pests far greater than to animal life? How do the values of animal and plant products compare? According to the report of the secretary of agriculture for 1905, the domestic animals of the United States are worth $2,995,370,277 in 1904. There are no figures as to the exact value of animal products, but estimating a similar increase from 1900, they would be worth approximately $2,-000,000,000. The total value of farm products are estimated by the secretary for 1905 at $6,415,000,000. Plant products would therefore be worth approximately $4,415,000,000, the ten staples alone being worth $3,515,000,000, while the value of all domestic animals and their products would be $4,885,572,394. In brief, the plant products are more than twice the value of the animal products and nearly equal in value both the live animals and the products they produced. These estimates include the value of the products of so-called 'farm forests,' but do not include the value of lumber or the virgin forests not on farms, conservatively estimated to be worth from three to four billion dollars, nor is the inestimable value of city shade trees and parks considered.

The losses occasioned by insects, exclusive of those to animals and stored products, have recently been estimated by Mr. C. L. Marlatt at $520,000,000, which is entirely conservative.

We would venture the assertion, therefore, that the annual losses occasioned by imported insect pests far exceed all losses of animals from

disease and of those human diseases which are subjects of national quarantine. Of course, we can place no money value upon human life, but were that possible, we have no doubt that the loss of plant products from a half dozen insect pests imported during the last quarter century would far exceed all losses from animal and human diseases which within that time have been the subjects of national quarantine.

The gypsy moth at present threatens the welfare of New Hampshire, Rhode Island and indeed of all New England, and, if unchecked, ultimately the whole country. Massachusetts has done, is doing and we believe will do, all in her power to check the pest within her borders. But why should her citizens be taxed sufficiently to prevent its spread to neighboring states? And what recourse have the other states, if Massachusetts does not prevent such spread? It would seem that Massachusetts is maintaining a public nuisance, as far as the neighboring states are concerned, but it is doubtful whether a suit could be entered against her on that ground, even theoretically, while actually it is of course entirely improbable. New Hampshire and other states can not make appropriations to aid Massachusetts. Why, then, is it not the duty of the federal government to protect the interests of the neighboring states by checking the spread of the gypsy moth and aiding in its control? The same reasoning will apply to all other introduced insect pests of serious importance. We should all admit that the federal government may prevent their importation, but some of us would claim that as soon as a pest had come upon the territory of any state, that the national government was then powerless to prevent its spread to other states. This same argument has been fully thrashed over in congress concerning human disease, and the present laws, as above outlined and administered, seem to the writer to have fully demonstrated that the federal government has such a right and may make and execute such regulations as seem necessary.

With such national laws and regulations, we believe that the introduction and spread of insect pests, either by transportation or by natural agencies, could be largely prevented. At present under the state laws they are not and can not be prevented.

Serious consideration as to whether it is not entirely feasible for congress so to legislate as to empower the Bureau of Entomology, or such agency as it may deem best, to make and enforce such regulations as will prevent the introduction and dissemination of insect pests, and to appropriate sums sufficient to allow such work to be done at once without awaiting special appropriations, is therefore urged. Only in this way can we have an efficient means of preventing the future importation and spread of insect pests which, if unchecked, may cost the nation millions upon millions of dollars, as those have done with which we are now familiar.

INDIVIDUAL ADAPTATION TO ENVIRONMENT

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IN a preceding article[1] the author has attempted to show that man, as a result of the development of medical science and education, is approaching his limit in evolution, both physically and mentally. The burden of the argument here was to show that, as a result of the incorporation into his environment of his cumulating knowledge, man's social and economical conditions are continually changing, but that with his increased intelligence he has greater power of adapting himself to the new conditions of life which are inevitably the result. And as soon as man acquired those intellectual and moral qualities which distinguish him from the lower animals, he began to invent weapons, tools and various stratagems to procure food and to defend himself, and was but little liable to bodily modification through natural selection. When he migrated into colder climates he used clothes, built shelter, made fires. He also aided his fellows and anticipated his future. Selection seized upon intelligence and man was enabled to keep an unchanged body in harmony with a changing environment. Progress implies a continued increase of control over nature, through the gradual acquisition of knowledge of her laws. One of the great fields of acquisition of human intelligence is along the line of human diseases, and the means of combating them. Medical science advanced until at present, through surgery and inoculation, she succeeds to a considerable degree in keeping the race adjusted to its ever changing environment without sacrificing many of her individuals, and, consequently, without bringing about any marked change in the type of the human body. Education, too, succeeds in maintaining the intellectually unfit by adapting them to the environment so that they are enabled to make a living and to bring up a family, thus precluding a rise in the average of intelligence in the race. Man is enabled to advance independently of heredity, and natural selection is cheated out of her work. Man can select everything in his world except his own body and mind. He is born with a body and mind which were developed by natural selection and are naturally adapted to the environment that existed when selection ceased. So adaptation to the environ-

[1] 'Limits of Evolution in the Human Race,' *University of Colorado Studies*, Vol. II., No. IV., June, 1905.

ment in which he is called upon to live (civilization) must be accomplished through artificial means. Physical adaptation, as was shown, must be by means of surgery and inoculation, and mental adaptation by means of education. It is the purpose of this article to consider the processes and significance of this mental adaptation of the individual to his civilized environment.

Civilization implies that each generation is working at a higher environing intellectual, moral and spiritual level, and with better tools, which their predecessors from generation to generation have devised and handed down to the subsequent one with usury. The essential thing in progress is that evolution has been transferred from the organism to the environment and that it is the accumulated social structure which persists. Civilization, therefore, is better characterized as a product than as the continual rise of average intellectual capacity. This product is the mold in which mediocrity is cast, and implies, merely, that the level of acquisition is becoming higher rather than the level of intelligence. The mediocre, and even the mentally poor, as well as the apt, are by means of education adapted to their environment and are thus enabled to survive and to bring up a family. Here, too, natural selection is barred from functioning, and for this reason man's mental evolution tends to a limit. One feature, inevitable in education, and which distinguishes social evolution from merely organic evolution, is the predominant part played by the fittest in raising the level of the less fit.

It is not, however, the motive here to discourage education, nor even to lament the fact that natural selection is thereby barred from further developing human intellectual capacity, but to consider progress as superorganic development of the environment, and education as the means of adjusting man to it. It is the method which most efficiently brings man into vital relationship with his intellectual inheritance, and which enables him thereby most effectively to realize himself, that is the interest here.

In order that the child may be enabled to come into the full and most effective relationship with his cumulative intellectual environment, three things must be fully understood, appreciated and taken cognizance of by the teacher in the training of that child. First, he must consider the material out of which the child is constituted, the clay, so to speak, out of which he expects to mold and build the adult. Secondly, he must know the order of appearance and unfolding of the child's various tendencies and powers, when instincts, interests and capacities appear, and how these can be made to function, if desirable, and become a permanent characteristic of the adult. Or, if undesirable, he must know how to keep those tendencies from functioning, in order to eliminate them and leave the individual as an adult free from their

taint. Thirdly, the teacher must know what sort of individual will best succeed as a member of society. This is an innovation; it is but a few years since teachers began to plan the adult the child is to be. But in order to plan an individual who shall be in harmony with his environment when he becomes an adult, the teacher must have an intimate knowledge and insight into the cumulative nature of the environment and the dynamic changes which society in all of its functionings and attitudes continually undergoes.

The first two of these essential qualifications of the teacher were first pointed out in a vital way by Rousseau, but he had no conception of the gravity of the third. Rousseau believed that the various tendencies and instincts as they appeared in the child were cues to what the normal individual should be, and should be seized upon in the educational process and made by habituation a permanent characteristic of the adult. Rousseau's ideas of 'returning to nature' were exemplified in his theory of teaching, and the result of such teaching was portrayed in Emile. This character is in the true sense savage. Not having fallen heir to his spiritual inheritance, he is a babe in his comprehension of the world. With never a passion curbed, he has no power of self-denial, and is blown about by every whim and caprice. Rousseau would observe the child in order that he may not overlook any of these tendencies as they appear. We have an entirely different motive in child observation. These instincts and tendencies are not to us indices of what the adult should be, but we study them and note their order of appearance in order that we may be enabled to exercise greater economy and efficiency in the teaching process. Our ideal is to exercise no faculty nor attempt its development until it naturally begins to function in the child's development. If such instinct or tendency is not a desirable characteristic of the adult the educator plans, then he needs to be most careful to inhibit its exercise. Most instincts are transient, and if given no chance to be exercised, and, consequently, to be developed into habits, they will die out, and it is as if they never existed. Instincts afford a wide range of possibilities for the educator to select from in developing the individual whose foundations for manhood he is laying.

When an instinct was allowed to die by not being given provocation to function, that which it would have secured for the individual is to a considerable extent beyond the possibility of acquisition later. For example, when the play instinct appears and the child is not allowed to play, or the play propensities are not called into activity, which is sometimes the case where there is but one child in a family, and where the parents are old and the child is tied, so to speak, to the mother's apron strings, that child, no matter what may be his social advantages later, will never be able to acquire that social poise which the other

adults possess as a result of the exercise of play tendencies when they normally appeared. On the other hand, when that cruelty instinct, which almost invariably appears at a certain age in every child, is put into a favorable environment, so that it functions and is fastened as a permanent characteristic upon the individual, no matter under how wholesome moral influences he may be thrown in later life, there is there a tendency to cruelty which can hardly be eradicated. It is likely because this instinct is allowed to function in so many children that there are so many cruelties exercised and murders committed in adult life.

Those instincts and tendencies of the child in its various stages of development are not indications of what the ideal individual ought to be, but are, on the other hand, a portrayal of the history of the race. They appear in the order in which they functioned virtually, and were, therefore, seized upon by natural selection in the order in which their possessors were rendered superior to their fellows as a result of their functioning.

As a result of conditions which are inevitable in a civilized community, such as prevail where there is sympathy and conscience, the intellectually and morally, as well as physically, fit raise the level of the less fit and unfit, so that they all are enabled to have offspring and to have their descendents maintained, natural selection ceases to function and physical, mental and moral evolution in the race consequently ceases. All the instincts, or at least many of them, continue to appear, just as the physical disharmonies continue to appear; and as surgery must get rid of these disharmonies (such as the appendix) in each individual, so must education rid the individual (and each individual) of these tendencies which throw him out of harmony with the present mental and moral environment.

Now the third essential qualification of the teacher, that of understanding the dynamic nature of society and progress, is indispensable. In planning and deciding what sort of a man I want my boy to be, if he is to be completely adjusted to his environment, and consequently to get the most out of life, I must in all respects be able to see into the future and to anticipate the conditions when he is to be an adult. I must, in other words, understand the nature of the change which conditions undergo in the meantime. To illustrate, suppose I am living at a time when typesetting is a good vocation. A typesetter has shorter hours and better remuneration than any other artisan. I plan to make my boy a typesetter. He, as a result of my careful training, develops into an efficient typesetter. He obtains a place and good wages. He marries and by the time he has a good-sized family depending upon him, some one comes along and invents a typesetting machine. He loses his position. He is obliged to serve as an unskilled laborer,

probably for the remainder of his life. He is to a considerable degree thrown out of harmony with his environment, and his attitude toward the world is not very wholesome, because of his mal-adjustment to it. He feels that the world is growing worse because it is now hard for him to make a living. Man tends to realize himself only in so far as the conditions remain the same during the period of his application as they were during his period of preparation and adjustment.

The same tends to hold true in the intellectual world, and it seems that Osler's point of view is not without substantial support. The world as a whole continually moves forward in its general notions about things. The individual tends to lag. The professional man, even the scholar, in his point of view, in his way of looking at things, tends to become fixed. The lamentable consequence is that, like the type-setter, his services to society ultimately become less and less useful and vital, and he likewise loses his position, and is supplanted by one who has the vital point of view. It is a daily occurrence that a teacher's, a minister's, a professional man's, even sometimes a college professor's, services are no more wanted.

The question comes, can the scholar keep abreast with the times? The most strenuous effort will almost invariably fall short of its attempt. Our ideas integrate into a system. An apperceptional something functions in all intellectual life. The ideas in our minds are the standards by which we receive new truths and ideas. We crystallize into our notions about things; in other words, we form habits of thought as well as of action, and thus become fixed in our theories and attitudes. Considering, therefore, the fact that every subsequent impression upon the mind of a person is viewed in the light of what is already in the mind and fixed, it is not difficult to see why it is almost impossible for that mind to accept an entirely new point of view, no matter how reasonable that point of view may seem to one whose ideas as standards are in consonance with the new view-point.

Ofttimes it happens, however, that scholars are far ahead of their times. They are dreamers or prophets. They anticipate a more or less distant future, and their thoughts and standards all integrate into a system consistent with their point of view. There are only a few whom they can interest in their lofty conceptions. The man most popular in his time is he who gives expression to what the world gropes after, who lives what they feel, who makes their felt wants real. But the environment, intellectually as well as physically, is cumulative, and soon society will have outgrown him. He becomes obsolete. He has given them the means of stepping beyond him to a higher interest. They are now shouting to another hero who is helping them still another step higher in realization. The world keeps on shouting, but continually to new individuals.

Individuals ofttimes in their popularity pass downward in the ranks of society. A man gives expression to something only the elect can comprehend and appreciate; soon classes attain to it and then the mass. Darwin and Spencer, here, are good illustrations. Such individuals may give expressions to things which are universal and consequently are vital for all time; or merely to conditions, the expression of which is the beginning of their fulfillment.

In conclusion, there are elements in character and habituation which are universal just as there are universals in expression. But as a result of the ever-changing conditions to which man is subjected both economically and ideally, he may be in complete harmony here and now with his environment, and as time passes, because of the nature of habituation and ideation, he is less and less able to keep in complete consonance with the spirit of the times. If, however, one understands the nature of the changes which society undergoes he can adapt himself to those consistent changes and thus avoid becoming soured. It is only as the principles of evolution are consciously seized upon and applied to personal life in society that individual adaptation will be facilitated and adjustment automatized.

THE DISEASE AND THE REMEDY

By ALFRED E. P. ROCKWELL, M.D.
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WE stand in this country on the threshold of a great civic awakening, a great economic renaissance, and we should hasten to forge from every opportunity offered by public sentiment, some substantial token of a larger and more exalted citizenship.

Government is the means by which the will of the people finds expression, and in a republican more truly than in any other form of government the character of the laws, and the efficiency with which they are administered, justly interpret the character and enlightenment of the average citizen.

The evolution of the individual, in proportion to the opportunities which the times afford, the suitable husbandry of the public purse, the proper development of natural resources, the conservation of human energy, the time required to convert what is known as public sentiment, all make it imperative that we now lay the foundation for the more efficient application of those principles which have been found best calculated to further those ends.

The physical, mental and moral qualities of the average citizen should be the unit of measurement upon which all estimates of national wealth, wisdom and virtue are based. The nearer these three personal qualifications approach perfection the greater becomes the value to society of the individual, and so intimately are they associated that derangement in one of these spheres is productive of more or less disturbance in the others.

Good physical health is the foundation upon which the mental and moral natures are built. Physical deficiencies in a large measure are responsible for mental and moral defects.

Every human life should be an asset of the nation; an asset the value of which should be determined by its productivity. By productivity is meant every exercise of creative, constructive power in the physical, mental and moral spheres. The highest productive potential is developed from the proper combination of two factors, in the creation and operation of each of which both the individual and the state share certain responsibilities. In the wholesomeness of the moral stamina, the efficiency of the mental equipment and the extent of the physical energy we find the first factor, and may measure the worth of those qualities which the individual is in honor obligated to contribute to

social progress, and for the attainment of which he is largely to be held accountable.

It is the duty of the state, on the other hand, to furnish as the second factor the best possible environment for the cultivation of those attributes, which will secure to him, his neighbor and posterity the largest measure of 'life, liberty and happiness.'

Obviously, then, the best interests of both the state and the individual are mutual, and the benefits derived by each from the faithful performance of duty are reciprocal. The individual and the state can not be divorced.

Every human life, however, is not an asset. All lives at some period are not only non-productive, but are the source of considerable expense to the state or relatives and friends, and each unproductive life becomes a proportional burden upon all productive society.

The chief cause of unproductiveness in the adult is inefficiency, and the chief cause of inefficiency having been found by competent investigators to be disease, we must feel that health and disease have too long been considered from the narrow standpoint of an individual blessing or calamity. As our commercial and intellectual activities increase, our socio-medical problems have been multiplied until it has become imperative that we view them in their economic aspects and deal with them accordingly.

To the ultra-conservative or the uninformed it may appear that the elevation of preventive medicine, in its largest and most comprehensive sense, to the importance of a great economic issue, is a step unpractical if not unnecessary.

If, however, under the conditions which now prevail, we add to the cost of human suffering, mental and physical, the financial cost of disease to the individual and to the state in the maintenance of hospitals, asylums, jails, permanent and periodic quarantine regulations with their accompanying commercial disturbance, and then subtract from this total the cost of those diseases which, in the present light of science, are known to be preventable, provided adequate prophylactic measures can be enforced, we shall readily discover in the remainder the warrant for presenting this subject in the dignity of one of national economic consequence.

If adequate relief is to be rendered, it is necessary that ultimate, not proximate, causes and remedies be sought. We shall, therefore, undertake to view in a full yet not extravagant light the terms and factors with which we must deal.

Few people realize the value and importance of a human life. If its value were better understood, a very different conception would prevail regarding the necessity of certain measures, which thoughtful and far-seeing persons are endeavoring to call to popular attention.

The courts have arbitrarily placed the value of one productive male at $5,000. This is estimated on the basis that the interest on $5,000 at six per cent. is $300, the amount of wages which a man would earn at $1 a day for three hundred working days. If then, the husband of a family is killed by the railroad, and his wife secures a judgment of $5,000, it is believed that she has obtained in this sum the equivalent of his services to her and her children. This is not true. That life was worth more than $5,000 to the family and to the nation. Few common laborers in this country to-day earn less than $1.50 per day; for three hundred working days this would be $450, which is 6 per cent. of $7,500. But the wife in these days could not obtain 6 per cent. interest on this sum in any safe investment. We will not here speak of the progressive increase in the cost of living compatible with the maintenance of self respect, a very important consideration. If she could safely secure, in the Eastern States, at least, 4 per cent. she could consider herself fortunate, and if the judgment instead of $5,000 should be $10,000, this at 4 per cent. would not amount to her husband's annual wage.

In the case of the death of a mechanic earning $2.50 per day, the loss to the family and the state, computed on the 4-per-cent. basis, would be represented in round numbers by the sum of $19,000. As we advance in the social scale we find that intelligence begets increased productivity, and increased productivity in the individual represents to the state and to the family, the social unit, greater monetary value as an asset.

Some lives are of much greater value to society than are represented merely by their physical and mental creative powers. How are we to estimate the value of such lives as Lord Lister, Lady Henry Somerset, Lincoln, Clara Barton, Edward Everett Hale, Charles W. Eliot, Andrew Carnegie, Bishop Brooks, Ralph Waldo Emerson, Tolstoi? Not in the value of their actual physical and mental productivity during life can the estimate readily be made. Not even in the value of the force of their example alone, but in the great impetus which such personalities give to the realization of high ideals, the purification of social and political life, and in the betterment and advancement of the race are we to look for a just estimate of their worth. A worth which it is impossible to calculate on a commercial basis. Yet these units are subjected to practically the same chances of infection from contagious diseases, and countless other dangers, as the average citizen. It is not the duty of the state to provide special means for the protection and preservation of such lives, but to institute such general measures as will reduce to the minimum such agencies as menace all human life, thus saving to the service of the state lives of all classes of society, the annual ruthless waste of which now amounts to hundreds

of millions of dollars in value. It is beginning to be understood that, from the monetary standpoint alone, the value of a productive male life to the state is even greater than its value to the family dependent upon that life. The state makes a financial investment in every life, and every day the amount of that investment is increased, and every day the value of each human life should be greater than ever before. In other words, it costs the state a number of hundred dollars (in Massachusetts about $500), to educate alone, and rear to the normal producing age each human life, and when a life is lost much more is lost in addition to the sum invested and the compound interest thereon. That life can never be replaced. Its power to produce is gone forever, and no one can take its place. All others living and to be born have their own work to do, must bear their proportional part of the state's burden.

The causes contributing to impair the quality or shorten the period of productiveness in the individual may be classed as preventable and unpreventable. Those included in the latter class are storms, floods and other forces of nature, unforeseen accidents, the few unpreventable diseases, and like fortuitous conditions. Among the preventable causes of unproductiveness we find insanity, crime, preventable diseases (contagious and otherwise), unsanitary factories and schools, bad sewerage, poor water supply, and the like.

The efficiency of a life becomes impaired and is a potential social burden through disease. Disease is a deviation from the normal, and is now understood to mean more than mere physical disability, for individual and national productiveness is found to be impaired through the manifestation of disease in three forms: First, poor physical health, largely the result of preventable diseases; second, poor mental health, insanity for example, the cure for which lies in the direction of its prevention; third, poor moral health, as illustrated in the various forms of what is called crime, most of which can be prevented.

We have seen that the causes contributing to a greater or less impairment of individual usefulness are of fundamental importance, and universal in their distribution, and any remedy which is to be successfully and economically applied must be likewise basic in character, and of sufficient scope to meet the conditions present.

It becomes incumbent upon us then to strive to raise the standard, physical, mental and moral, of each voter, thus expediting the task of showing him the importance of the relation between the activities of the state and those of the individual.

For generations we have waited, and are still asked to wait, for our school children to develop and rise to carry these burdens; to improve politics; to enact more righteous laws; to secure to the people a more uniform and beneficent government; and we forget the while that when

they leave, with meager education, the public school, they must immediately plunge into the breadwinning maelstrom to emerge the same fatigued, misguided voters that their fathers are. Much of the information which it is essential that the intelligent voter possess, in order that he may make the most of every day in his life, can not be taught by the public school system. First, because the amount of knowledge which they are obliged to purvey is so great that the entire public school machinery is already overworked, and they could not, even if they thought it feasible, install the necessary equipment to extend their labors to other fields. Second, because the juvenile mind is not capable of weighing and determining matters of economic importance.

A large proportion of our voters, after securing a rudimentary education, are obliged to labor, and fail to pursue further the studies begun. They seldom read anything save a more or less misguided, hysterical and misleading newspaper. The fatigue resulting from daily physical labor is not conducive to intellectual activity in the form of instructive reading at night, and hence we find our average voter growing up woefully ignorant of the essentials of good government, and dependent, as already indicated, upon self-interested, irresponsible and unreliable sources for his misinformation.

The great disease at the root of almost all evil is ignorance, and the remedy is education. Were it not for ignorance, that universal malady, it would not be possible for so many agencies to exist which diminish the happiness and its corollary, the producing capacity, of the race.

In the supplemental education of the laboring adults upon a broad and practical basis rests the remedy for the present unhappy condition. A large proportion of our countrymen fail to keep abreast of the times in their methods of thinking and of living, because the demands which breadwinning makes upon their strength and time prevent their obtaining authoritative information on the thousand and one subjects, a knowledge of which would lighten their burden and brighten their pathway.

If it can be borne in upon the public mind that many diseases can be avoided, that the amount of insanity can be reduced, that crime with its great attendant expense can be decreased, that the producing capacity of man can be increased, while augmenting at the same time the number of his comforts and the extent of his leisure, there will be a demand for something looking toward relief, and almost any reasonable measure will be actively supported.

Information of the sort needed to secure the interest and cooperation of the voter, whose support is essential to the accomplishment of his own betterment, must be easily accessible, and presented in

a form sufficiently authoritative and attractive to insure its reception and assimilation. He does not know that if it were possible to precipitate upon society any of the millennial measures which are frequently advocated by a certain class of agitators, confusion, anarchy and woe would result. It would not be possible for man to adjust himself to new conditions so suddenly thrust upon him. He must be shown that only by advancing step by step along evolutional pathways already well defined, can permanent progress be made, knowing that any radical departure therefrom inevitably invites disaster.

We are confronted with a profound economic problem, and for its solution federal authority and machinery are necessary. There should be established by the federal government a Department of Public Betterment, which should consist of a board known as the Board of Public Betterment, appointed by the President, together with a cabinet officer known as the Secretary of Public Betterment, to be selected by the President. Their entire time should be devoted to this department, and a salary sufficient to insure this result should attach to the position.

In personal character they should resemble the personnel of the United States Supreme Court, and should be selected from the country at large with special reference to their high intellectual attainments, and with the view of associating together men who severally are authorities upon pedagogy, medicine, economics, industrial problems, finance, and similar interests which affect every citizen. In the interest of convenience and economy the work of the department should be divided between two bureaus. One for the accumulation and classification of knowledge valuable to the department, which might be known as the Bureau of Research of the Department of Public Betterment, and one designed to disseminate and apply the knowledge thus obtained, which might be known as the Bureau of Publicity of the Department of Public Betterment.

It should be the function of the former to ascertain the causes of diseased conditions, and search for the prevention of those causes. It should investigate, compile and supply data relative to the numberless problems associated with municipal government, crime, insanity, immigration, child labor, the length of the working day, the preservation of the sabbath day, and extension of holidays; the construction, ventilation and sanitation of public buildings, and the vehicles of common carriers; educational hygiene; modern philanthropic methods, idleness, divorce, marriages against public policy; public institutions, their character, establishment and administration; strikes, commerce and the like.

The Bureau of Publicity of the Department of Public Betterment should be empowered to institute such measures as seem wise to correct the evils above indicated. It should have authority to pre-

vent the spread of diseases; to stop the publication of indecent literature; to close all factories producing injurious foodstuffs; to divorce politics from the public schools, to deal vigorously with the tenement-house problem, the liquor habit and like evils which impair individual, and consequently national, health and productivity. In the event of pestilence, famine, flood, drought, war, or any similar calamity in any part of the land, it should be the function of this bureau to render immediate assistance as required. This bureau should have power to appoint from time to time as needed competent tribunals to adjust and prevent strikes and the like, selecting for service men especially fitted to deal with special conditions as they may arise.

The Bureau of Publicity of the Department of Public Betterment should organize a corps of lecturers, the men composing which should be recognized authorities in the departments of knowledge which they severally represent. They should be selected with the greatest care. The highest authority on a given subject would not necessarily be the most useful lecturer for the department. The best man for the purpose of this plan would be one who has the gift of conveying in comparatively simple and concise English scientific facts, and who, withal, is an attractive and entertaining speaker. Excessively technical treatment of any subject would soon result in empty lecture rooms. To understand the need for, and the appreciation by the public of, such free lectures as here contemplated, one has but to familiarize himself with the history and operation of free lecture courses as given in some of our large cities. It is idle to address people on subjects which do not interest them, and matters in which the population of one district, affected by a certain combination of conditions, are greatly interested, would not attract the slightest attention in another section of the country where other conditions obtain. There are certain subjects relative to personal health, municipal administration, trusts, patent medicines and the like, which should prove popular as material for lectures throughout the country.

The elaboration of a schedule for the suitable distribution of lectures and their varied subjects is but an administrative detail. Some plan incidentally determining the relative popularity of the several lectures upon given subjects would serve as a valuable guide in the matter of their selection. It would also tend to stimulate in each lecturer a desire to improve his matter and his style. At times there would be a greater demand for lectures upon certain subjects than at others. When a city was considering the reorganization of its school system, or the improvement of its water supply, there would naturally, in response to the popular interest in these matters, be a greater desire to secure authoritative information upon these subjects than at other times. In the event of the invasion of the Pacific coast by the bubonic plague,

the people of that section would be much more interested in securing instruction for its extermination than the New Englander. Manufacturing interests in the state of Rhode Island would demand in many respects very different treatment from the coal mining sections of Pennsylvania, and each of these would fluctuate in local and general interest.

In short, the Department of Public Betterment should not only stand ready to answer rightly questions of public interest, but, further, take an active part in their just solution and adjustment.

In view of these considerations it would be unwise to keep a fixed number of lecturers constantly employed, but secure, as the demand developed, the men necessary for the work.

It may be urged that the daily press in a measure already does the work aimed at. In reply to this contention, it should only be necessary to call attention to the growing distrust prevalent regarding the reliability of newspaper science and sociology. Moreover, from the earliest times, the instruction given by word of mouth has always been more eagerly sought after, and has proved more fruitful in results than the printed page.

The objection may be raised that political preferment and intrigue will soon permeate, and finally paralyze, the department's activities. In answer to this, we need but call attention to the United States Supreme Court, against which similar prophecies have been made, only to be unfulfilled. No intelligent person has ever entertained a suspicion that political evil ever invaded the sanctity of that august body. If, as is entirely practicable, the same great care be exercised regarding the selection of the members of this board, and the preservation of its political isolation, no anxiety need be felt with regard to its integrity, and the efficient and impartial exercise of its functions.

It should be the duty of the Department of Public Betterment to make a careful study of the needs of the people, and supply them with necessary information whereby they may secure their own betterment. This is now done in a limited way for certain classes. For example, the Department of Agriculture, the annual expense of maintaining which is about $6,000,000, has experiment stations scattered through the land which investigate the special needs of the farmers of different sections, and as rapidly as information is secured it is printed and given as wide distribution among agricultural and similar interests as its character warrants. It is well known that this policy has not only saved to the individual farmer the expense of personal experimentation, but has been the means of enriching him, and has incidentally developed the productiveness and increased the acreage of farm lands of this continent, reduced the price of foodstuffs, and put many millions into the public treasury. Why should not this same thing be

done in an appropriate and practical manner for other classes of society, the mechanic, the miner, the laborer, according to their special needs?

It should further be the duty of the Department of Public Betterment to systematize and consolidate, in the interest of efficiency and economy, all efforts now being made to convey to the people a knowledge of how to live better. Many states, for example, spend large sums annually to support a State Board of Health which does much work that is merely a repetition of that done elsewhere, and most of which could be done better and more economically by the Department of Public Betterment.

There is ample excuse for the existence of such a department in this government. There are many odds and ends left over from the work of other departments which could more properly and more satisfactorily be centralized in the department suggested. Much of the work of the existing departments does not properly belong to them, and is, therefore, imperfectly done or periodically neglected. All this should be turned over to the Department of Public Betterment, which should, when properly developed, attain a position of first importance in the federal service, for the extent of the field to which the activities of such a department might be legitimately applied is almost limitless.

It may be urged that we already have local boards of health and health officers, seaboard and other quarantine regulations, general and insane hospitals, laws governing the questions of factory and school sanitation, child labor, the liquor habit, and the like. Praiseworthy and helpful as are the present efforts to preserve the public health, they are entirely inadequate to meet the demands of an ever-progressing civilization.

The officers who have in charge these agencies for the prevention of disease, and upon whose vigilance we are each dependent for our personal safety, even though selected for their good moral character and fitness, are not given the necessary authority and funds to enforce adequate preventive measures, are underpaid and are constantly hampered and humiliated by the intrigue of political meddlers. This is not a suitable system of preventive medicine for a self-respecting and highly civilized republic.

Expensive as may be the execution of the plan herein outlined, its possibilities as an economy in the administration of the state, in its prevention of crime, insanity, costly physical suffering, and the maintenance of the public institutions which these things entail, far outweigh the consideration of the cost of its installation.

It must be remembered that the accomplishment of all these things would not only result in great saving in individual, city, state and national expense, but would further create a more intelligent citizen-

ship, which would, through its own increased productivity, own more property on which larger taxes would be collected and expended for the benefit of all. This should be borne in upon the voter's mind, and when he fully comprehends its real import, true socialism will have been born. Take to the voter a direct and consistent story, show him the ruthless waste of treasure which comes primarily from his purse, point out to him the intelligent exercise of the franchise as the remedy, and improved civic conditions will prevail. But, in order to be helpful and of the highest usefulness, this plan must follow certain well-known laws of social evolution, and paternalism with its attendant subtle evils must be guarded against with the greatest vigilance. And in passing it may be well to register a protest against the present epidemic of uncoordinated, misdirected and impotent 'philanthropy' which, notwithstanding its well-meant purpose, fails to do aught but blight the fiber of the receiver, and fritter away the energies of the giver, thus proving injurious alike to both. Such heterogeneous and pestilential efforts might well be termed criminal philanthropy.

Let the better element in society forget class distinctions, sectional strife, sectarian differences and personal bickerings, and take up seriously the consideration of these problems.

Unless thoughtful persons are prepared to formulate and act as a unit in the furtherance of some such plan as here indicated, it will very appropriately be asked, "If these people who are accredited with possessing superior intellectual attainments, and who profess humanitarian purposes, can not agree among themselves when there are at stake matters of such vital consequence to all mankind, how can they expect to attain their ends, and obtain from less talented persons the cooperation necessary to succeed?"

Nor let us squander our resources in needless discussion and the costly delay it entails. It must be remembered that time also is a national and individual asset, for the proper use of which a higher power is to hold us accountable. When the welfare of human life is in the balance, trivial and senseless controversy is criminal.

Notwithstanding the industry with which the medical profession, already overworked, and frequently grievously misunderstood, seeks to propagate progressive ideas regarding the acquirement and maintenance of health, personal and public, never can a decisive conquest of ultra-conservatism, bigotry and ignorance be made without the active support of thoughtful and discerning people.

THE PSYCHOLOGY OF YELLOW

By HAVELOCK ELLIS

THE part played by red as a powerful stimulant in the psychic life is clearly pronounced and fairly uniform among all peoples at all grades of civilization.[1] The special emotional tone of yellow is by no means so easy to define. It varies to a marked extent at different historical periods, in different regions of the globe, even under civilized conditions, at different ages in the same individual. There is no color which is sometimes so exalted in human estimation and sometimes so debased. The psychology of yellow thus presents problems which are peculiarly difficult to unravel.

Among primitive peoples the delight in yellow seems to be almost universal. Red is the favorite color of savages, but—as in the personal decoration with ochre of the tribes of Central Australia, according to Spencer and Gillen—yellow is easily second, and sometimes perhaps on the same level with red. Indeed, it may even at times seem to be preferred to red. Thus in some parts of New Guinea, although the natives are fond of scarlet, they take the trouble to feed a certain parrot having red tail-feathers on a yellow root (for they have no means of dyeing) until the tail feathers turn yellow.[2] As a general rule, when dyes are known, bright yellow, after or with scarlet, is the favorite color, as it was among the Society Islanders. It was so, not only among the savages of the Pacific, but also among our own ancestors, and the primitive German woman used yellow and red ochre to adorn her face and body.[3] The early Europeans seem to have been by no means always careful to distinguish between their two favorite colors of red and yellow; they saw both colors in gold, the most precious material of their adornments; the phrase 'red gold' is almost modern, and the Kirins of the Caucasus, according to Abercrombie, used for gold a word (borrowed from the Tartars), which also means red.

Young children, who are at one with savages at so many points, share their love of yellow, and usually indeed prefer it to red, though some writers, like Scripture, are inclined to account for this as due entirely, as in large measure it doubtless is, to the greater brightness of yellow. As to the reality of the preference among the children of various nations there seems to be little doubt. Preyer's child liked and

[1] Havelock Ellis, 'The Psychology of Red,' *Popular Science Monthly*, Aug., Sept., 1900.

[2] R. E. Guise, *Journal Anthropological Institute*, Feb., 1899, p. 214.

[3] G. Buschan, 'Leben und Treiben der Deutscher Frau in der Urzeit,' p. 7.

discriminated yellow. Miss Shinn found that yellow was her niece's first favorite color, and, in her twenty-eighth month, she had a special fondness for daffodils and for a yellow gown. Mrs. Moore found that in the sixteenth week her child chose a yellow ball in preference to a red, and, later, in the forty-fifth week, six times out of ten preferred the yellow ball. Binet's child could not readily distinguish yellow, but was especially successful with orange. A lady who made some experiments for me with a Belgian child one year of age found that when successively offered a red poppy and a yellow poppy, then red, white and yellow poppies, finally red, white, orange and yellow poppies, she on all three occasions chose the yellow poppy, though on the third trial she hesitated between the orange and the yellow poppies; when she passed yellow poppies growing she would point to them and want them, and was also observed to contemplate admiringly a sunflower, though usually indifferent to flowers of other colors, except pink geraniums. At this age, no doubt, the preference for yellow is mainly a question of luminosity, for the careful investigations of Garbini on a large number of children showed that under the age of three they may almost be described as color-blind and experience a special difficulty in distinguishing yellow, which even at a somewhat later age is often confused with orange.[4] When children show genuine color preferences, they appear, like adults, to be only to a slight degree attracted by brilliancy, but to a large extent by depth of saturation. This was found to be the case by Aars, who in testing color preferences used colored papers of similar brilliancy and depth. His results indicate that, as Barnes had already found, children's love of yellow diminishes with age; even between the ages of four and seven, though yellow was still one of the most favorite colors of the boys, it had ceased to be in any degree a favorite color with the girls. Lobsien, at Kiel, investigating the color preferences of a large number of school girls between the ages of eight and fourteen, reached congruent results; he adopted the method of offering the colors in pairs, and found that while orange was never preferred to any other color, there was a tendency at all ages to prefer yellow to green and usually to violet, but never to red or blue.[5] These results harmonize with the conclusion of Garbini that in discrimination of color girls are more precocious than boys, though it must be added that, as in physical development, the period of adolescence brings to an end this greater rapidity of girls in development; thus Wissler, in comparing the color preferences of freshmen and seniors of both sexes, found (as Jastrow had previously found) that with age there is a shifting of preference towards the violet end of the spectrum which is the favorite end of men, red being that of women.

[4] Garbini, *Archivio per l'Antropologia*, 1894, fasc. 1.

[5] Lobsien, *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, 1904, p. 42.

Investigations on students in various countries have almost invariably shown that yellow is the least attractive color. In Germany, Cohn found among students that yellow, even in any degree of saturation, was never the preferred color.[6] In determining the color preferences of 100 students in Columbia University, it was found that yellow came, at a considerable distance, fourth, being only followed by green, while Wissler found that, for male and female students alike, yellow is of all colors the least frequently preferred (by two per cent. of the men and five per cent. of the women); among the men it was also the most frequently disliked, though among the women this dislike was transferred to orange.[7] The dislike of female students to yellow, it will be seen, seems a little less marked than that of male students. This is confirmed by an inquiry at Wellesley College, where it was found that though only 10 per cent. of the women preferred yellow, it was yet more frequently preferred than green or violet.[8] At Cornell University, in a series of careful experiments on a small number of individuals, Major considered that there was no evidence of a positive dislike of yellow, yet all his subjects found yellow or orange among the least pleasant colors.[9]

Among adults generally, it must be said finally, that yellow and orange are very seldom the favorite colors, and in ascertaining the color preferences of 4,500 men and women at the Chicago Exposition, Jastrow found that yellow and orange were the least preferred colors, though here also women seemed to like yellow more often than men.

But for mankind in general these results, undisputed as they probably are, do not hold universally good. There is one vast and highly important area of the world, by no means uncivilized in large part, where yellow, so far from being disparaged, is held in the highest honor. Throughout nearly the whole of Asia, ancient and modern—in Assyria, in India and in Ceylon, throughout China, in the Malay peninsula—yellow is usually the supreme and most sacred color.[10] In India and Ceylon yellow is preferred, whether in flowers or in garments, and the substances that produce yellow dyes are held in highest honor and are essential in the ritual of many ceremonies; in the ceremonial of Hindu marriage, for instance, turmeric is always necessary. Turmeric is in India the substitute for the saffron, probably used by the Aryans be-

[6] J. Cohn, *Philosophische Studien*, Vol. X., p. 562.

[7] C. Wissler, 'The Correlation of Mental and Physical Tests,' *Psychological Review Monographs*, Vol. III., No. 6, p. 17.

[8] C. Mills, 'Individual Psychology,' *American Journal Psychology*, 1895.

[9] D. R. Major, 'Affective Tone of Sense-impressions,' *American Journal Psychology*, October, 1895.

J. Jastrow, 'The Popular Esthetics of Color,' POPULAR SCIENCE MONTHLY, 1897, p. 361.

[10] The geographical distribution of the love of yellow has been especially investigated by Arnold Ewald, 'Die Farbenbewegung,' pp. 64 *et seq.*

fore they reached India, which with its brilliant yellow as of the rising sun has been used by the men of many lands from the earliest ages. It was perhaps connected with sun-worship, as turmeric appears to be to-day in India.[11] In Persia saffron possessed magic qualities and even in the medieval Europe saffron was worn in little bags and constantly used in the preparation of food. The Soma, it may be added, is of a golden color and is still used in Persia as a yellow dye. The Buddhists, again, hold yellow in highest honor, and the sacred flower of the Buddhists is yellow. In Persia, yellow is a favorite color, as it was with the Hebrews, for in the *Song of Songs* the bride is compared to saffron. In China, yellow is the fortunate color, though largely sharing this virtue with green and red. In the Malay states, white is holiest of all and is used to conciliate demons, but after white yellow is by far the most sacred color. According to Malay annals, a certain sultan prohibited the wearing of yellow garments in public, and even the use of yellow handkerchiefs or curtains, because yellow is too sacred for ordinary mortals, and ever since yellow has been the royal color in all Malay states.[12] It may be added that on the western borders of Asia, in ancient Egypt, although yellow was not the supreme color, it was still held in high honor; the favorite combination to express splendor was gold and lazuli.[13]

Even in classic Europe, at the highest moments of the civilization we inherit to-day, yellow, though not occupying the sacred position it has always held in Asia, was yet a preferred color, always mentioned with an affective tone of delight. In both Greece and Rome—somewhat curiously, in view of what we have had to note of the psychic reaction to it in modern times—though red was the most sacred color, yellow was the color for the festival garments of women and children, and was especially worn, Pliny states, by women at marriage. It was also the color of the priests of Cybele. Red and yellow, according to the same author, were the colors that dominated in ancient pictures. The four primary colors, according to Empedocles, are white, black, red and yellow, exactly the four colors which Nietzsche, discussing the philology of classic color-words, states that the Greek world seems to have been made of. Yellow was with red the favorite color of Homer, and Latin poetry is specially rich in synonyms for yellow.

What is the meaning of this clash of feeling between the modern European world, on the one side, and, on the other, the ancient classic world and the universal sentiments of Asia? It is not obvious why we should have ceased to delight in a color that to the men of another

[11] An interesting study of the sacred uses of yellow in India has been written by Dymock, 'On the Use of Turmeric in Hindoo Ceremonial,' *Journal Anthropological Society of Bombay*, 1890, pp. 441–448.

[12] W. W. Skeat, 'Malay Magic,' p. 32.

[13] Flinders Petrie, 'Egyptian Tales,' pp. 83 and 95.

age and of another continent has seemed so precious, the color of the sun, of gold and of corn, of honey and of amber. It is still a very familiar color to us, alike in sunlight and artificial light, and when not too intense is in no degree fatiguing to the sense-organs; harmonious tones of yellow, indeed, in the scheme of the decoration of a room, are for many, perhaps for most, people highly agreeable to live in. Nor can we claim that our dislike to yellow reveals a more refined esthetic sensibility than the ancients possessed, for the painter knows nothing of this antipathy. In Rembrandt, indeed, we have a painter of the very highest rank who, as he slowly approached the culminating point of his art, was more and more fascinated by yellow, until in the end his pictures, even his portraits, are entirely covered by the shimmer of old gold.

It was clearly the advent of christianity that introduced a new feeling in regard to yellow, leading, as Magnus has remarked, to a preference for the dark end of the spectrum. In very large measure, no doubt, this was merely the outcome of the whole of the christian revulsion against the classic world and the rejection of everything which stood as the symbol of joy and pride. Red and yellow were the favorite colors of that world. The love of red was too firmly rooted in human nature for even christianity to overcome it altogether, but yellow was a point of less resistance and here the new religion triumphed. Yellow became the color of envy.

In some measure, however, this feeling may have been not so much a reaction as the continuation of a natural development. The classic world had clearly begun, as savages have begun everywhere, with an almost exclusive delight in red, even an almost exclusive attention to it, and for Homer as for the Arabs the rainbow was predominantly red; yellow had next been added to the attractive colors; very slowly the other colors of the spectrum began to win attention. Thus Democritus substituted green for yellow in the list of primary colors previously given by Empedocles. It was at a comparatively late period that blue and violet became interesting or even acquired definite names. The invasion of christianity happened in time to join in this movement along the spectrum—for even in the second century after Christ's birth Aulus Gellius when discussing colors scarcely mentions green and blue —and in doing so christian energy was reinforced by its instinctive repulsion for the brilliant colors associated with pagan rites and customs. Thus it was that not red or yellow, but blue, the hue of heaven, became the traditional color of the Virgin's raiment. In ecclesiastical usage yellow has never been regarded with favor; it has usually been either a color to avoid or to treat with indifference. This feeling has not diminished with the centuries; in 1833 the use of yellow in priests' garments was prohibited, and in the protestant church yellow has never been used at all.

Yellow became the color of jealousy, of envy, of treachery. Judas was painted in yellow garments and in some countries Jews were compelled to be so dressed. In France in the sixteenth century the doors of traitors and felons were daubed with yellow. In Spain heretics who recanted were enjoined to wear a yellow cross as a penance and the inquisition required them to appear at public *autos da fe* in penitential garments and carrying a yellow candle.[14]

There is a special reason why christianity should have viewed yellow with suspicion. It had been the color associated with wanton love. In the beginning the association was with legitimate love; it has already been noted that in classic times the bride's garments were yellow, while in the *Iliad* as well as in the Indian *Gitagovinda,* a bed of saffron is prepared for lovers. But in Greece, and to a still more marked extent in Rome, the courtezan began to take advantage of this association. The Greek hetaira and her Roman successor wore saffron-colored frocks and dyed their hair yellow. That professional custom of dyeing the hair has to some extent persisted, as we know, among their successors for more than two thousand years, throughout the middle ages to the present, and the injunction of Menander (as quoted by Clement of Alexandria), 'No chaste woman ought to make her hair yellow,' has been a perpetual refrain among the fathers of the church. It was as a reflection of the evolution of yellow in this direction that it became the symbolic color of inconstancy and adultery.

The outcome of the history of yellow during these two thousand years has been a curious opposition and contrast in the emotions it suggests. On the one hand, the affective tone of yellow in general has slowly become for most people either negatively indifferent or positively unpleasant. But the primitive and classic glorification of yellow has not absolutely died out. It has only concentrated itself around the word 'golden.' We see this mixed attitude reflected in the poets. They use the word 'yellow' with extreme parsimony as compared with their profuse employment of 'red,'[15] but 'gold' and 'golden' constantly recur, and always with an emotional suggestion of beauty and splendor and joy. This is, for example, very marked in Keats. Even, however, in the use of 'golden,' it is still possible to trace a latent antipathy to the color yellow. In primitive times—among the Celtic makers of the Irish cycle of legends, for instance—it was the color quite as much as the preciousness of the metal that is felt to be desirable. But among our modern poets 'golden' has come very largely to mean what is beautiful or delightful, with little or no reference to

[14] Lea, 'History of Auricular Confession,' Vol. II., p. 87.

[15] Wordsworth seems somewhat to insist on yellow, and shows a special predilection for yellow flowers; it was part of his general scheme in rehabilitating common and despised things. Walt Whitman shows a somewhat similar predilection for 'yellow' and a disdain of the conventional 'golden.'

color. The epithet of 'golden-mouth,' which became the name of the eloquent Chrysostom, shows that 'gold' was used in a highly symbolic sense at an early period in the history of christianity, while Shakespeare's 'golden lads and girls' is typical of this vague poetic use of the word. 'Golden' in English has largely come to mean not yellow or any other definite shade of color, but merely beautiful and precious, as 'red' means in Russia. The same contrast between 'yellow' and 'golden' may be found in other European languages; in French, for example, the affective tone of *jaune* is totally different from that of *or*, and it is the same in Italian and most other allied languages. As a general rule yellow is not applied by the poets to any object which suggests a definitely beautiful emotional tone, while 'golden' only in a minority of cases, as when applied to hair, corn, etc., bears any insistence on definite color.

It is not until the middle of the last century, at all events in England, that we find any definite revival of the old classic feeling in regard to yellow. It is very notable in Swinburne, who dwells with pleasure on honey and amber and other yellow substances, emphasizing their color; yet at the same time he usually avoids the use of the word yellow; 'white and gold and red,' he declares, are 'God's three chief words,' and he marks his sense of the inferiority of the word in the lines:

> A comb of yellow shell for all the rest,
> A comb of gold for the king's daughter.

In the course of centuries and until recent times, we find, there has thus been a gradually diminishing tendency to insist on the color of any beautiful or desirable object that is yellow. At the same time, there has been a tendency to emphasize the associations of yellow, which are really founded on one of the most ancient observations of man. Yellow is the color of bile and of a jaundiced skin. Most of the evil passions and impulses of mankind, in the popular science of primitive peoples, have their origin in the liver and the bile. The degree to which mankind has been impressed by the yellowness of bile is sufficiently proved by the fact that bile has constantly served to supply a name to yellow; thus among the Eskimo, the Chukchis, the Samoyeds, the Voguls and other subarctic races yellow (and sometimes green) are called by a word which means bile.[16] Even in our own Aryan tongues it seems to be the same, and 'gall' lies at the root not only of 'yellow' but also of 'green' and even of 'gold.' Hence it is that yellow is the color alike of envy and of melancholy. We have in Shakespeare's phrase the 'jealous complexion' (orange) and 'green and yellow melancholy,' and in Pope the 'jaundiced eye' to which 'all

[16] W. H. R. Rivers, 'Colour Vision of the Eskimo,' *Proceedings Cambridge Philosophical Society*, Vol. XI., Pt. II., 1901.

seems yellow.' This perpetual inhibition, initiated by the early christians, of the agreeable associations of yellow, and the concomitant emphasis, not only in language but also in actual life, of all its most unpleasant associations, may possibly account for the predominant emotional tone of yellow among peoples of European origin to-day.

A doubt may indeed possibly arise as to the complete adequacy of such an explanation. Can we absolutely exclude any innate psychic tendency physiologically rooted in the organism? A curious circumstance recorded by Latta, in his careful psychological investigation of a man operated on at the age of thirty for congenital cataract, might possibly be held to support the doubt. The first color that the subject noticed on recovering from the operation was red, while green took him the longest time to master. But 'the first time he saw yellow he became so sick that he thought he would vomit.'[17] One might be tempted to regard this incident as a brilliant justification of the association between bile and yellow and of the attitude of christendom towards this color; an adult man, whose visual sense-organs have retained their virginal delicacy, at once becomes 'bilious' when he sees yellow! But, even putting aside the possibility of idiosyncrasy, it is fairly obvious that the man would approach the sight of colors with certain prepossessions; we are not told that he was shown yellow without being informed of its name, and since blind people are interested and curious with regard to the nature of color, we may well believe that this man had imbibed the current ideas as to yellow and that the appropriate affective tone was already associated with the color before he had ever seen it.

However that may be, the strange history of yellow in the human mind and its striking vicissitudes are not only full of interest, but they really bring us up to a great problem which the psychologist must constantly face under a myriad of aspects: the respective parts which must be assigned to the innate properties of the psychic organism and to the temporary reactions it has acquired under the influence of a slowly shifting environment. How far, the psychologist must so often ask himself, am I investigating the intrinsic qualities of the stream of consciousness? How far am I registering the images reflected from its banks?

[17] *British Journal Psychology*, June, 1904.

BIRD PHOTOGRAPHY IN NORWAY

By Dr. R. W. SHUFELDT
NEW YORK

AS any general reader of the magazines in this country thoroughly appreciates, there has been within the last twenty years a wonderful and widespread interest taken in the matter of photography of birds, their nests and their haunts. There is not a month that passes without some one of the larger magazines, or even several of them, publishing a bird article illustrated with a series of photographic reproductions from nature, and these are often from the pens of our best-known ornithologists. The effect has been that many of our commoner bird forms are now coming to be quite generally known, which was by no means the case forty or more years ago. But the United States does not stand alone in the production of this class of literature, and, old as the old world is, it has not come to be so antiquated that people no longer take any interest in its avifauna; indeed, the old adage that 'familiarity breeds contempt' by no means applies here, for, as a matter of fact, the very reverse of the proverb holds true, and the better we come to know the birds, the more ready are we to recognize the fascination of their closer acquaintance.

Having been a student of the world's ornithology for a period extending over forty years, and a continuous writer on the subject for a quarter of a century, the birds of Europe are nearly as well known to me as those of my own country, and the life histories of some of them mean quite as much to me. In this way I have become as familiar with the birds of a country like Norway as I am with those of any part of the United States, and some of them I have studied quite as closely, their habits as well as their anatomy. Now the Scandinavian camerists have not been idle in the making of life photographs of the birds of the North European region in general and of Norway in particular. Among these workers no one is better known, or more distinguished, than the veteran Norse naturalist, Professor Robert Collett, professor of zoology at the University of Christiania, who has been a correspondent of the writer's since the early eighties. Professor Collett spends his summer vacations in rambling over the most interesting parts of Norway, during which times he captures many bird pictures with his camera. He has kindly illustrated the present article for me and supplied some of the notes.

When one comes to study the land birds of Norway, one soon ascertains that many of them are resident species, a still greater number

FIG. 1. THE OYSTER-CATCHER IN ITS NORTHERN HOME.

of them are migratory, while still others belong to a small list of 'stragglers,' these last being birds that only accidentally occur there, and which, from one circumstance or another, are visitors by chance rather than by choice. This may happen in any country, as in the case of European birds being found in the United States, or American birds in England or elsewhere. It must be borne well in mind, how-

FIG. 2. NEST AND EGGS OF THE OYSTER-CATCHER.

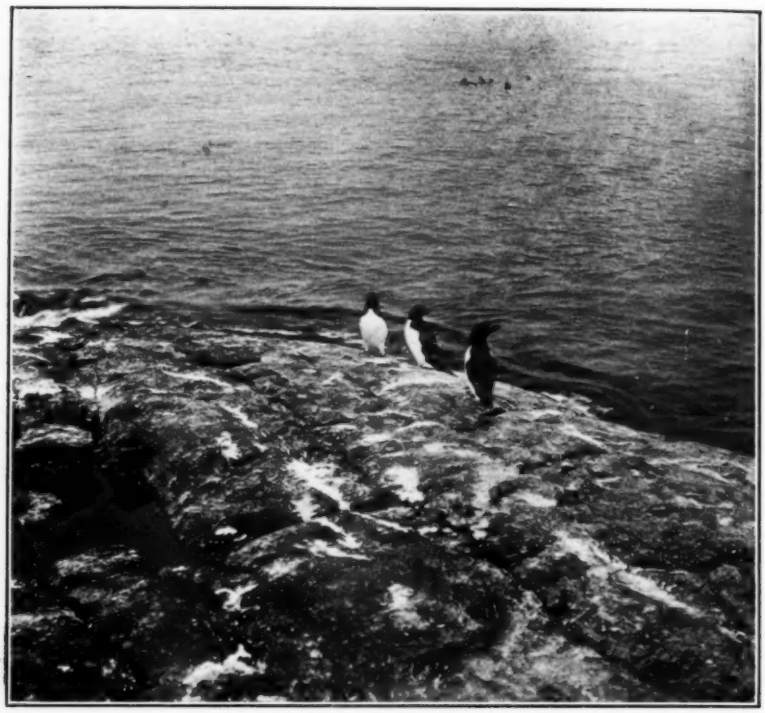


FIG. 3. RAZORBILL AUKS. Rocky Coast of Rott.

ever, that such occurrences are but accidents, and at the best extremely rare. The resident birds in Norway are chiefly boreal forms and some few of them are circumpolar in distribution, and are therefore found, not only in this country, but throughout northern Europe and Asia. On the other hand, the migratory land birds comprise those species which during the spring and summer pass up into the country from southern and western Europe, to return in the autumn. Many of these breed there, and their habits are well known to continental ornithologists. As to the water birds, the coasts, inlets, fjords and estuaries of Norway abound with them, as do many of the inland lakes and streams. Some of these numerous species are resident; a large number are migratory; and, as we should naturally expect, 'stragglers' from other lands and seas occur there from time to time. Not a few of the species are common to our Atlantic coasts, and a few others are of almost cosmopolitan distribution, in so far as the northern hemisphere is concerned.

Among the land birds there are represented the thrushes and their allies, various kinds of warblers; the dipper; titmice, nuthatch, the wrens, creeper, wagtails, pipits (one being peculiar to Norway), oriole and shrikes; flycatchers, finches and swallows; crossbills; the starling; crows and their allies; larks; swifts; the nightjar; woodpeckers and

wryneck; cuckoo; eagles, hawks and owls and some of their allies, and some few other forms. Then among the game birds there are ptarmigan, grouse, the famous capercaille, quail, doves, woodcock and others.

Passing to the water birds the list is still more varied. There is the gannet and two species of cormorant; several waders; swans and geese, and a variety of wild ducks, loons and divers; many snipe, plovers, sandpipers and their allies; curlew; gulls and terns, of which there are numerous species; skuas and petrels; guillemots and auks, and the puffins. In fact the ornis, as a whole, of Norway is by no means an uninteresting one, notwithstanding the fact that the majority of its representatives have been known and described for so many centuries past. With these facts before us then, it can easily be appreciated that the birds of Norway offer the photographer of such subjects almost as varied a field of bird life as he can find in the United States, and the same is true of their nests and eggs. Again, Norway is especially interesting in her topography and plant life, or flora. That this is so has led many of her bird photographers to include in their pictures more of the surroundings than is usually the case in similar productions taken in this country by American ornithologists. All the photographs illustrating the present article are good examples of this, and, in my opinion, everything else being equal, it gives them an additional value; especially as any one of them will bear enlargement either for lecture purposes or for figures.

For photography, many of the water birds offer wonderfully attractive subjects, and particularly on the coast north of Stavanger, where

FIG. 4. NEST OF COMMON GULL (*Larus canus*). (Bratvær.)

FIG. 5. BIRD ROCKS AT VARDÖ.

auks, gulls and various other kinds of water fowl breed in immense numbers on the high, bold cliffs facing the ocean. Puffins (*Mormon fratercula*) are also found here in myriads, inhabiting the bird-cliffs or 'fugleberge,' and these preserves are protected by their owners, who derive considerable profit from them.

In another locality off Stavanger, we find the small island of Rott. Here many birds breed, and in far more accessible locations, and often on the sandy and rocky stretches near the ocean. Cormorants breed here in numbers (*Phalacrocorax graculus*); at least two species of gulls (*Larus canus and Larus fuscus*)—the common gull and the

lesser black-backed. (See Fig. 4.) The European oyster-catcher is also found breeding on this island, a species closely resembling our own American form. An interesting photograph of the former, and the three beautiful eggs it lays among the stones and pebbles on the beach, is shown in Fig. 1 and 2. A large colony of the common gull were breeding in the near neighborhood. The inhabitants of this island of Rott belong to an ignorant class of coast people, who make profit on anything that mammal, bird or fish may bring them, subsisting themselves on the same products. They kill and eat both the cormorants and the gulls, and have a habit when the birds are first hatched of clipping the outer feathers of the wings, and consequently the birds are never able to fly. Then after they are full grown they

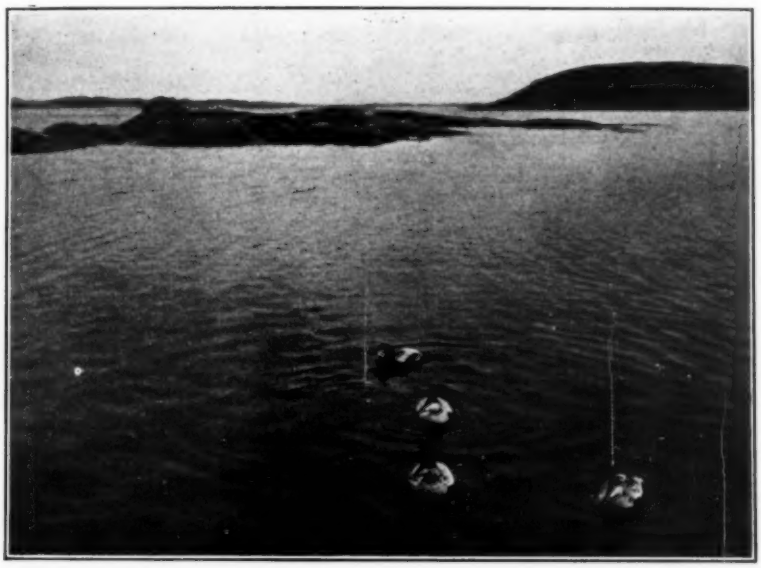


FIG. 6. EIDER DUCKS. (Bratvær.)

are easily caught and killed in numbers, being immediately salted down for winter food. With respect to the cormorants, the young are decapitated in their nests, as soon as they are old enough, and put to similar uses. Nowhere else in all Norway does this custom prevail. When Professor Collett visited this island of Rott, he ascertained that the inhabitants did not use the razorbill auks for food, and that these birds were marvelously tame, so much so that when he undertook to photograph them, one of the legs of his tripod was in touch with the tail of one of the birds in the immediate foreground when he secured the picture reproduced in Fig. 3. He was also in plain view at the time.

Another interesting picture of an auk (*Alca torda*) is shown in Fig. 5. This was secured at Vardö, in northern Norway. From this

FIG. 7. TENGMALM'S OWL IN ITS NATIVE HAUNTS.

view we can look seaward toward Spitzbergen, and directly in the direction of the North Pole. The auk is seen standing on the rocks in the middle distance; and also further to the left there is a gull.

Some charming photographs of wild ducks have been taken down at Bratvær, where the celebrated fisheries for torsk and herring are. There occur the famous eider ducks (*Someteria mollisima*), which yield the precious eiderdown, so extensively used as a lining for fashionable winter garments. These ducks heavily line their nests with this down, and its collecting is an industry of no little commercial importance. We also have several species of eider ducks in our own

avifauna, and in some parts of the world they have been domesticated. Bratvær (*Smölen*) is just outside of Christiansund, a place situated about midway on the coast of Norway.

Although wild specimens, the four male eiders seen swimming in Fig. 6 were so tame that they were coaxed ashore by having food thrown to them. The three spotted individuals in the picture are birds that are in the process of assuming their summer plumage. We have in this illustration an excellent view of the character of the off-lying rocky islands of this region.

In Norway they do not have nearly the number of species of owls that we have in our avifauna here in the United States, but still they have a few interesting different kinds. As a matter of fact, in the former country only about six or seven species occur, while over forty species and subspecies are known to inhabit the latter. Of these one or two are common to both countries, as, for example, the well-known snowy owl, and others. Again the little Tengmalm's owl is a common form in Norway, and we have a subspecific race of it in our avifauna. While rambling through the pine forests of Ringebo, Gudbrandsdalen, Professor Collett frequently met with Tengmalm's owl and obtained photographs of it. One of the most interesting captured of this kind is shown in Fig. 7.

As every sportsman who has hunted through Norway knows, the most numerous and important game bird is the ptarmigan, there designated as the 'rype.' It occurs in great numbers, not only on the islands off the coast, but also in similar regions inland, that is, in the fjelds region, or the birch and willow belts. Moreover, they are extremely plentiful on the treeless island of Smölen, in the bailiwick of Nordmöre, where recently they have been hunted with dogs, though the former practise was to snare them.

Several species and subspecies of ptarmigan occur in different parts of the United States, principally in the northwest and through Alaska, while in Norway the common form prevails—the *Lagopus lagopus* of science. A beautiful picture of the nest of one of the latter is shown in Fig. 8. The site selected by the bird was among the roots of several gnarled and twisted birch trees, which are peculiar to the upper birch forests where alone they occur, for, strange to relate, these same birch trees grow quite straight and perpendicular in the lowlands, constituting a difference I am at present unable to explain. It will be noticed that there are but seven eggs in this nest, while a ptarmigan may lay at least three more to complete the clutch. Ptarmigans are white in winter, but tawny and mottled in their summer plumage, so when the female is sitting upon her nest she harmonizes very well with her surroundings. Professor Collett photographed this specimen while she was sitting, but he tells me the picture is not a success.

FIG. 8. NEST OF PTARMIGAN. (Orkedal.)

American ornithologists have frequently obtained fine photographs of a number of our game birds while they were sitting upon their eggs, as grouse, quail and woodcock, and several of these I have published in former articles.

THE PROGRESS OF SCIENCE

THE NIAGARA PROBLEM UNDER LEGISLATION.

THE whirlwind of public expression in regard to diversion of Niagara waters, which has swept through the daily and periodical press, probably constitutes the most notable outburst of recent times over an essentially sentimental proposition. Making allowance for easy extravagances of statement natural to semisensational news articles, the serious elements in the problem have been agitated with so much force and with such preponderance of protests against further encroachments that the whole subject has found its way to the tribunals where the people have undoubtedly wished to get it.

By legislation or treaty, or both, the existing situation, which actually seems to menace the perpetuity of Niagara's natural beauties, can undoubtedly be remedied, but it still remains to be seen whether it will be. At the present writing the remedial measures instituted and in progress at Washington and Albany have created a situation from which the public may, at least, expect some salutary results, but which does not yet justify the rather noisy claims of various civic organizations that they have 'saved Niagara.'

The president in his last message to congress urged legislation and suggested treaty relations with Great Britain to the desired end. Governor Higgins in his annual message earnestly pressed the situation upon the New York legislature. President Roosevelt intimated that if New York could not take care of her rights in Niagara she might cede them to the federal government, but New York has not been inclined to entertain this proposition. Early in the present session of congress Senator Platt introduced a concurrent resolution authorizing the president to invite the cooperation of Great Britain in the appointment of an international commission which should undertake to make recommendations as to the solution of the problem and to appoint the American members thereof. The progress of this resolution, reported by Senator Burton out of the committee on foreign relations, was obstructed by the objection of Senator Teller, who thought that inasmuch as it was essentially a New York matter it must take its allotted place on the calendar, to be reached at some indefinite period in the future. It is understood that in the meanwhile the president had referred the matter of possible treaty relations to the secretary of state, but, if the press reports are correct, the efforts made by this official through the usual diplomatic channels have not yet borne fruit.

Meanwhile the international waterways commission, authorized a few years ago by the secretary of war to consider all problems arising in regard to the control of the boundary waters between the United States and Canada, after specially investigating the conditions during protracted hearings held at Niagara Falls last summer, has made an *ex parte* report in regard to diversion in the Niagara River, that is, a report adopted only by the American section of the commission. This is very strongly condemnatory of the existing and impending situation, and forcibly urges immediate legislation by congress to limit abstraction, if the beauty of the falls is to be preserved. This report calls attention to the fact, elicited by their inquiry, that the present authorized diversion from the Niagara River is 60,000 cubic feet per second, 26,700 to be taken from the American side and 34,200 from the Canadian; that this amount is 27 per

cent. of the average discharge and 33 per cent. of the low water discharge of the entire river. It recommends as propositions for legislation by congress that the secretary of war be authorized to grant permits for the diversion (from the American side, of course) of a total not to exceed 28,000 cubic feet per second, this to include not only the power companies but the Erie, Welland and Chicago Drainage Canals. This prohibition is to remain permanent if after two years the Canadian government shall have enacted legislation prohibiting diversion of water pertaining and tributary to the Niagara River in excess of 36,000 cubic feet per second. Press reports indicate that the Canadian section of this commission, in making return to their government, dissent from the attitude of the American section, insisting that the most apparent damage to the falls must necessarily result from American diversion which affects the American side only. This attitude is undoubtedly just, and it is to be seriously questioned if the American section of this commission has given full weight to the fact that diversion of 28,000 cubic feet per second will much more seriously damage the flow of water through the American channel than the abstraction of 36,000 from the other side will affect the Canadian channel.

In the New York legislature action was begun by the introduction of a bill repealing four of the eight outstanding charters for power companies. As these four charters were already dead, the bill passed the senate. This was followed by another senate bill, introduced by the disinterested author of the former, restricting the consumption of water by the four remaining American companies to a maximum of 17,200 cubic feet per second each, or a total of 68,800 cubic feet per second, an amount more than the entire volume of water flowing through the American channel. The public is now too well informed to welcome just this brand of salvation for the falls, and the author of this bill deliberately killed it, saying that he was 'tired of trying to save the falls and could find no sentiment in favor of saving them.'

In the assembly Mr. Cox has introduced a concurrent resolution looking to a referendum for a constitutional amendment to prevent abstraction beyond that already chartered, and Mr. Foelker a bill so worded as to prohibit all American companies and all foreign companies doing business in this state to take more water than is actually being taken at the time of the passage of the act and instituting heavy penalties for violations of these provisions. This is the most radical measure that has anywhere appeared on behalf of the conservation of the falls and is probably the only measure that could actually effect a cure of the present menace to the American cataract. It is demonstrable and already demonstrated, that the full chartered consumption of waters by the American companies will dismantle the American falls, but the influence of these companies is far reaching, and in a public hearing on the two assembly bills mentioned it was decided to amend the Foelker bill so as to leave the companies their charter rights with penalties for transgression of these, and in this form, with the real vital clause extracted, this bill and also the Cox resolution have been reported and advanced. There never has been the slightest probability that any of the power companies would exceed their chartered rights of diversion. Indeed the entire contention has been that it is this chartered right which endangers the falls, and it is the recognition of this fact that constitutes the very meat of the recommendation by the international waterways commission. It does not seem, therefore, that the Foelker bill, should it become a law, will help the situation. Of more practical merit are the six bills, also introduced by Mr. Foelker, repealing the six

outstanding charters, four of which are the already dead ones, killed again by the senate bill above referred to, and two the very perniciously quiescent companies, one of which is known to be controlled by a large railroad corporation. It remains to be seen whether these six repeal bills can get through the senate. So far then as the pending legislation at Albany is concerned, it will have little effect on the people's hope for Niagara whether the Foelker restriction bill wins out or fails, but it will be a most important step forward if the six Foelker repeal bills should succeed in reaching the governor.

THE REPORT OF THE PRESIDENT OF HARVARD UNIVERSITY.

THE annual reports of President Eliot form a series of educational documents of great and permanent interest, by no means confined to the great university over which he presides. The current report states that the principal event of the year was the raising by general subscription of the 'teachers' endowment fund,' amounting to $2,300,000, for the increase of salaries in Harvard College. This was locally necessary, as the university was in danger of losing its men to other institutions; it is also of general academic interest. The average salary of the 57 professors in Harvard College was $3,980, and only 13 received as much as $5,000. The maximum salary has now been increased to $5,500 to be paid to all after a long enough period of service. The average salary of 38 assistant professors was $2,130, and of 88 instructors $990. These salaries have also been increased. The largest ordinary salaries at Columbia are $5,000, at Yale $3,750 and at Pennsylvania $3,500. It appears to be most unfortunate that while our leading universities have spent vast sums for grounds and buildings, the salaries have remained stationary or have even decreased. The academic career should be made attractive by freedom, security and congenial work rather than by large salaries, but the salaries should be as large as those received for equal performance in other professions. Harvard has once again led the way in an important educational reform.

The report contains an account of the failure to form a merger with the Massachusetts Institute of Technology. The reason given is the decision of the supreme court forbidding the sale of the present site of the institute. This is technically correct, but the value of this land is really a small matter. It could have been readily transferred to the city for park or other public purposes without cost to the institute if the removal and the combination with Harvard had met with general approval. The fact is that the plan failed because the faculties and alumni of the two institutions opposed the union that was favored by the presidents and the corporations. We have here an interesting question of ultimate academic control, which President Eliot fails to discuss or even to notice.

Some elaborate statistics are given in the report in regard to students who have taken different kinds of college degrees during the past fifteen years at fourteen institutions of different type. These show that the old classical course has completely lost its predominance. The A.B. degree is now given at Harvard without Latin, though a classical language is still required at entrance. In many institutions, for example since 1901 at Michigan and Cornell, and since 1904 at Wisconsin, the A.B. is given without regard to the kind of entrance examination, and the number of degrees of this kind has greatly increased. Thus Wisconsin gave only 21 A.B.'s in 1903, as compared with 194 in 1905. Where two or more courses are maintained, one retaining more or less of the classics and the others without, the classical course tends relatively to lose ground. Thus in 1891 there were at Yale 832 students

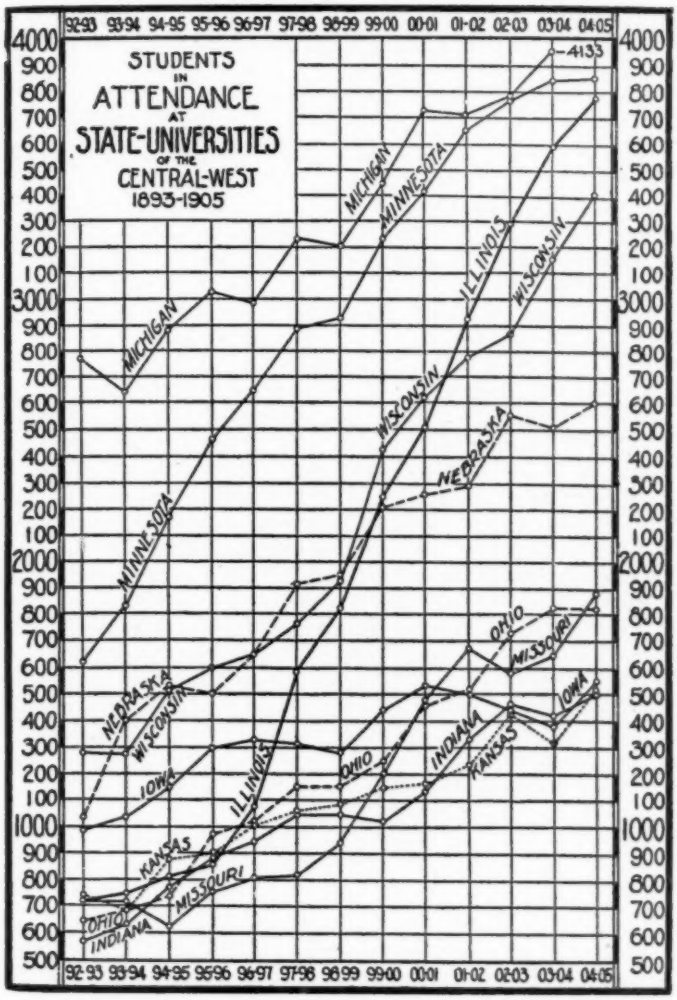
THE HARVARD CORPORATION.

in the academic department and 374 in the Sheffield Scientific School; whereas last year the numbers were 1,275 and 875. In Princeton the similar figures are 504 and 155 in 1890 and 838 and 558 in 1905. President Eliot appears to favor giving only the A.B. degree for undergraduate study, but Harvard has this year established a bachelor of science degree in the college.

Of the many other interesting topics treated in the report, we can only mention the severe arraignment of football. No one objects to seeing our 'young barbarians all at play,' but

under existing conditions of professionalism and commercialism, President Eliot does not perhaps word it too strongly when he says: "It is clearly the duty of the colleges, which have permitted these monstrous evils to grow up and to become intense, to purge themselves of such immoralities, and to do what they can to help the secondary schools to purge themselves also."

Harvard University has a form of government different from that of other American universities. Since 1650 the corporation has consisted of the president, the treasurer and five fellows, who are in certain respects responsible to the board of overseers, which is now elected by graduates of the college.



By the courtesy of the *Harvard Graduates Magazine*, we are able to reproduce here portraits of the present members of the corporation. The body is so small that the members take an active interest in the welfare of the university; they have always been men of distinction in the community.

THE GROWTH OF THE STATE UNIVERSITIES OF THE CENTRAL WEST.

HARVARD was once under the control of the State of Massachusetts; now there is agitation in favor of taxing the university. This change in attitude may not injure the university, but it is unfortunate for the people. In the central and western states the universities are supported with increasing liberality. In spite of the vast endowments of Chicago and Stanford, there is reason to believe that the state universities of Illinois and California will not be allowed to fall behind. The extraordinary growth of the state universities of the central west is shown on the accompanying chart, which was used in connection with the inauguration of President James, at the University of Illinois. The sevenfold increase in the number of students at that university in twelve years is most remarkable, but it is nearly paralleled by Minnesota and Wisconsin.

The present registration in the largest eastern private foundations is as follows: Harvard, 5,283; Columbia, 4,755; Cornell, 3,871; Yale, 3,477. In the four leading state universities of the middle west it is: Michigan, 4,521; Minnesota, 3,940; Illinois, 3,635; Wisconsin, 3,083. There are 17,386 students in the one group and 15,179, in the other. The increase last year in the eastern institutions was 320, in the western 554. The future growth of these universities will be a matter of interest. But it must be remembered that the greatness of a university is not measured by its size. The Johns Hopkins with 688 students has on its faculty thirty of our leading men of science; Illinois with 3,635 students has only six.

THE TOMB OF JAMES SMITHSON.

ONE of the last services of the late Professor Langley, secretary of the Smithsonian Institution, was his share in the removal of the body of Smithson from Genoa to Washington, where it now lies in a mortuary chapel at the north end of the Smithsonian Institution. Smithson died at Genoa on June 27, 1829, and was buried in the little English cemetery on the heights of San Benigno. There was originally no reference on his tomb to his foundation of the Smithsonian Institution, but a tablet was erected some ten years ago by the regents, who also undertook the care of the grave. But it became necessary to move the cemetery, and Dr. A. Graham Bell proposed to bring the body of Smithson to America to rest in the great institution of which he was the founder. Dr. Bell offered to defray the expenses, but was commissioned by the regents to undertake this duty on their behalf. He immediately proceeded to Genoa, where he arrived on Christmas Day of 1903. With the cooperation of our consul, Dr. Bell was permitted to exhume the body and bring it with him to the United States, where it was received with naval and military honors. On March 6, 1905, the remains were replaced in the original tomb in the chapel of the Smithsonian Institution, where they will rest until congress makes provision for their interment.

The story of Smithson's life is this: The illegitimate son of the first Duke of Northumberland, he was a gentleman commoner at Pembroke College, Oxford, and was elected fellow of the Royal Society in 1786 at the age of twenty-one. He made contributions to chemistry of some importance, but suffered from ill health and discouragement. He lived on the continent, and was at one time at least a Jacobinite, regarding a king as a 'contemptible encumbrance.' He left his fortune to his nephew with the provision that if he died without heirs it should go 'to the United States of America, to found at Washington under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men.' The United

THE TOMB OF JAMES SMITHSON IN THE SMITHSONIAN INSTITUTION.

States accepted the bequest, which amounted to $550,000, and after long discussion within and without congress the institution was established, which has so completely carried out the wishes of its founder.

SCIENTIFIC ITEMS.

WE regret to record the death of Nathanial Southgate Shaler, professor of geology at Harvard University; of James Mills Peirce, Perkins professor of astronomy and mathematics at Harvard University, and of Robert Ogden Doremus, emeritus professor of chemistry at the College of the City of New York.

PROFESSOR E. C. PICKERING, director of the Harvard College Observatory, has been elected a corresponding member of the Berlin Academy of Sciences. —Dr. Henry F. Osborn, professor of zoology at Columbia University, and curator of paleontology at the American Museum of Natural History, has been elected a foreign member of the Linnean Society of London.—Dr. William Osler, regius professor of medicine at Oxford University, has been elected a member of the Athenæum Club, under the provisions which empower the annual election of nine persons 'of distinguished eminence in science, literature, the arts, or for public services.'

FATHER J. G. HAGEN, S.J., professor of astronomy in Georgetown University, and director of the observatory, has been offered the directorship of the Vatican Observatory.—Mr. Arthur Eddington, B.A., B.Sc. (Manchester), of Trinity College, Cambridge, senior wrangler in 1904, has been appointed chief assistant in the Royal Observatory, Greenwich.

THE American Philosophical Society is holding as we go to press a meeting in memory of the two-hundredth anniversary of the birth of Benjamin Franklin, its founder. In addition to the scientific program, which includes papers by Sir George Darwin and Professor Hugo de Vries, there are a number of special addresses. Professor Edward L. Nichols, of Cornell Univer-

sity, will speak on 'Franklin's Researches in Electricity' and Professor E. Rutherford, of McGill University, on 'Modern Theories of Electricity and their Relation to the Franklinian Theory.' Special addresses in commemoration of Franklin will be made by Dr. Horace Howard Furness, President Charles W. Eliot and the Honorable J. H. Choate, and the Honorable Elihu Root will, in accordance with the act of congress, present the Franklin medal to the Republic of France.

THE Clarke School for the Deaf at Northampton, Mass., will receive an annual income of $1,500 to enlarge the training school facilities from the fund recently received by the Association for Teaching Speech to the Deaf, given to them by Dr. A. Graham Bell. Dr. Bell became heir to about $75,000 from the estate of his father, Dr. Melville Bell, the inventor of the system of visible speech, and he made over this sum to the association. His condition was that it should be used as a permanent memorial of his father's connection with the subject, the homestead in Georgetown, D. C., to become the office of the association, for printing, etc., and about half the property to have its income devoted to the training of teachers of the oral method.

FOR the best essay on 'Moral Training in Public Schools' a prize of five hundred dollars is offered, and for the second best, three hundred dollars. The conditions are: (1) Length of essay to be not less than 6,000 nor more than 12,000 words; (2) each essay must be submitted typewritten; (3) all essays must be in the hands of the committee not later than June 1, 1906. These prizes are offered by a citizen of California who desires his name withheld. He has appointed Rev. Chas. R. Brown, of Oakland, California; President David Starr Jordan, of Stanford University, and Professor F. B. Dresslar, of the University of California, Berkeley, 'trustees of the fund and sole judges of the merits of the essays submitted." The two prize essays shall become the property of the trustees, to be by them 'published and circulated as widely as possible' from the fund at their disposal 'within the limits of the United States.' Any essay not awarded a prize will be returned to the writer upon request, accompanied by postage.